VOL. XX. No. 1

JANUARY 1935

MECCANO MAGAZINE



THE WORLD'S LARGEST BUCKET EXCAVATOR
(see page 2)

6D.

MECCANO

MOTOR CAR CONSTRUCTOR OUTFITS

MECCAUTO 538189



No. 1 Motor Car Constructor Outfit

One of the most fascinating of all boys hobbies, either indoor or outdoor, is model car operation with cars built from Meccano Motor Car Constructor Outfits. Perfect miniature reproductions of many different types of car can be built with these splendid Outfits, including sports four-seaters, speed cars, sports coupés and others.

Now is the time to get a Meccano Motor Car Outfit. You will never grow tired of building and running the superb models that you will be able to build.

No. 1 Meccano Motor Car Constructor Outfit

The motor car models that can be built with this Outfit are the finest you ever saw. Look at the examples illustrated at the left-hand side of this page and think of the fun you could have building these and other types equally graceful and realistic.

No. 1 Outfit is available in four different colour combinations and is supplied complete with powerful Clockwork Motor.

Price **13/6**

No. 2 Meccano Motor Car Constructor Outfit

Larger models of a superior type can be built with No. 2 Outfit. Their handsome and realistic appearance may be judged from the illustrations at the right-hand side of this page.

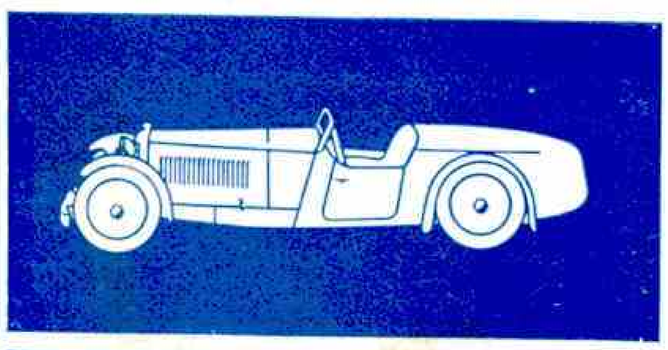
No. 2 Outfit is available in four different colour combinations, and a powerful Clockwork Motor that gives a run of 150 feet on one winding is included. Price **25/-**

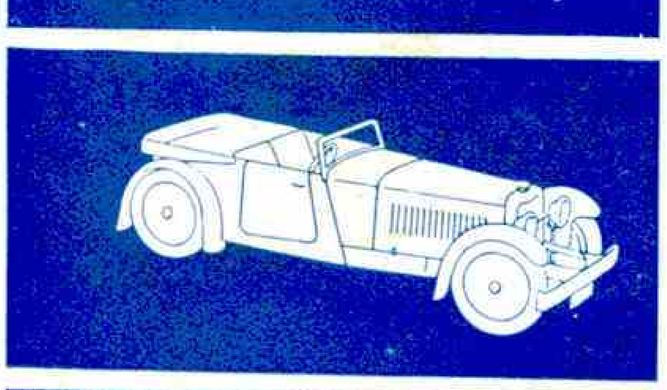
Manufactured by

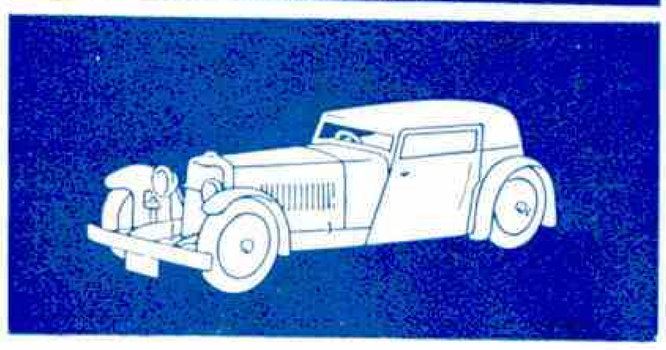
Meccano Ltd., Binns Rd., Liverpool 13

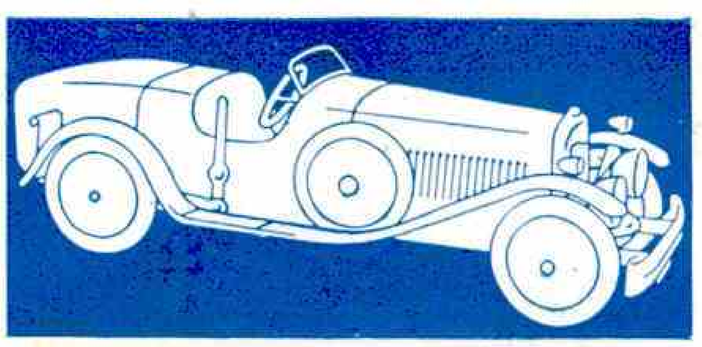


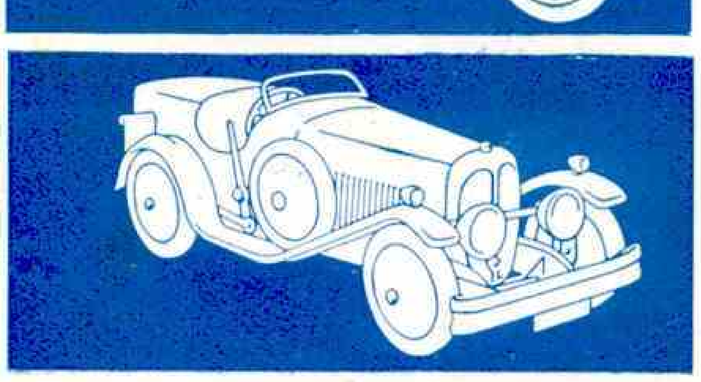
No. 2 Motor Car Constructor Outfit

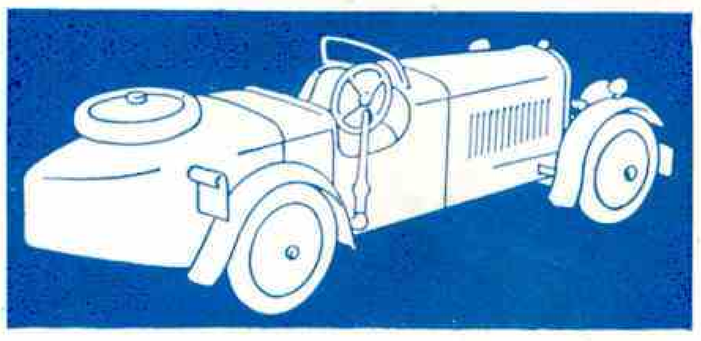








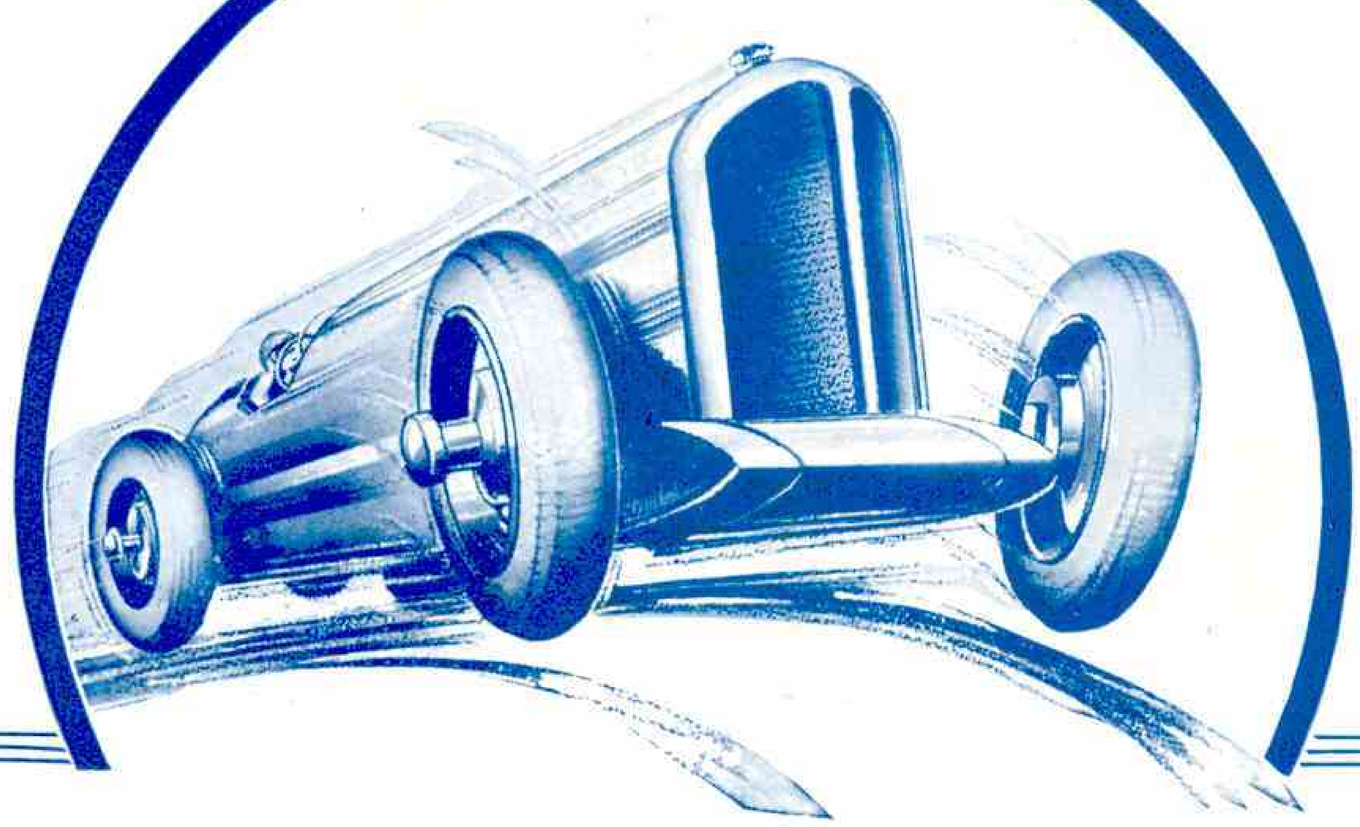




Motor Car Lighting Set

This Lighting Set enables the headlamps of Motor Car models built with the No. 2 Motor Car Outfit to be electrically lighted. Price **2/6**

PRODUCT of MECCANO LIMITED LIVERPOOL



Motor Car Garage

The Meccano Motor Car Garage provides accommodation for any Meccano model motor car or other car of suitable size. It is strongly built, with imitation rough-cast finish. Inside dimensions: Height 5 in. Length 13 in. Width $7\frac{3}{4}$ in. Price **5/6**

TRI-ANG TOYS

for a HAPPY NEW YEAR!



MITCHAM
1935 Model

A smart car with all steel body and disc wheels with ½ in. white rubber tyres. Tubular windscreen, petrol and oil tins. Stove enamelled in Beige with scarlet wheels. **21/-**



FAIRYCYCLE No. 2

Best tubular frame, 14 in. wheels and 1⅛ in. white auto-tread tyres. Ball bearing pedals. Rim brake on front wheel. Chain case and stand. Finished in Black or Blue. **39/6**

DOLLS' PRAMS



20/U.T

Body constructed of light steel with attractive design pressed into the panels. Special low-mounting chassis. Long tubular handles stove enamelled black. Folding hood with nickel-plated joints. Two pairs of dressguards. Body is finished in high gloss weatherproof colours. Complete with apron and storm flap. **25/6**

24/C

Made and finished just like a full sized pram. Light steel body with brilliant weatherproof finish and stylish moulded design. Folding hood of rubber duck lined and laced. Apron with storm flap. Wire wheels with chromium-plated hubs and rims. 1⅛" jointless sponge rubber tyres. Long chromium-plated handles. Two pairs of dress-guards. An extremely attractive toy. **63/-**

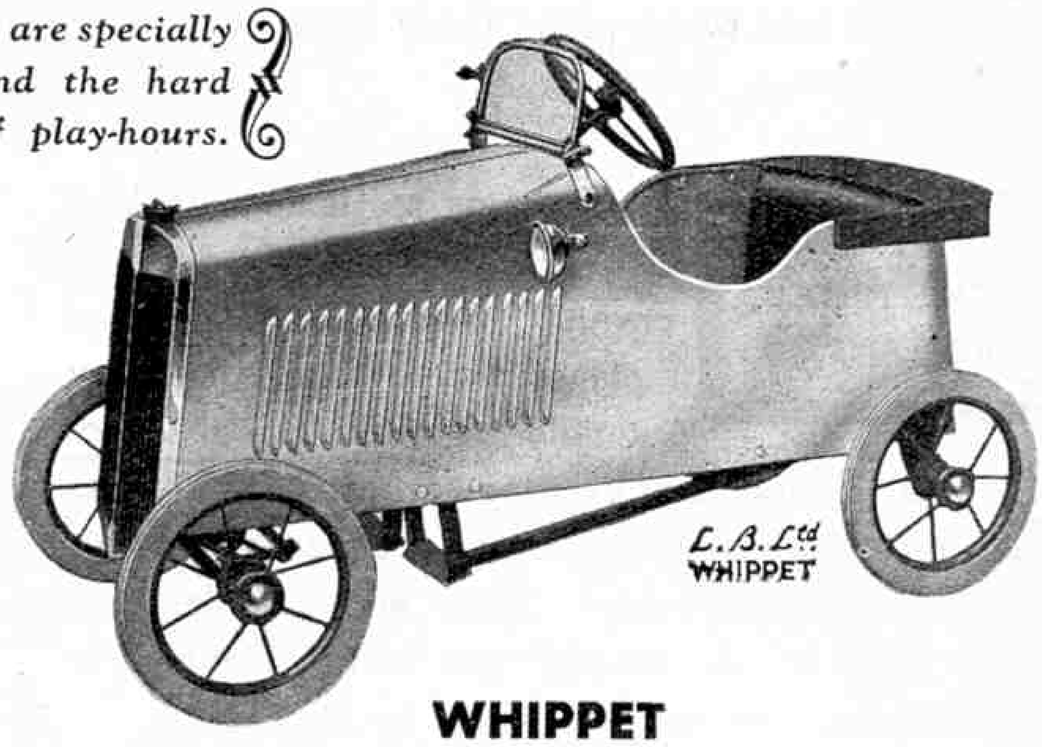


Tri-ang wheel toys are specially made to withstand the hard wear and tear of play-hours.



TRI-ANG TRIKE No. 5

This splendid Tri-cycle cannot overturn. Best quality cycle tube frame, stove enamelled Black or Blue. 14 in. cycle-type wheels. 1⅛ in. sponge rubber tyres. Ball bearing pedals. Chromium-plated fittings. **59/6**



WHIPPET

New racing model with polished aluminium body. Magna type radiator, with plated top and rim. Tubular windscreen. 1⅛ in. jointless sponge rubber tyres. **42/-**

LINES BROS. LTD., Tri-ang Works, Morden Rd., London, S.W.19

SECRETS of SCALE MODEL AIRCRAFT DESIGN

The third of an interesting series of articles by the well-known designer responsible for the construction of the most perfect of all scale model aeroplanes, the "FROG" and "PUSS-MOTH"

3

Scale Model Aeroplane v. Model Flying Machine

First of all, I must make it quite clear that a model Flying Machine is not a model Aeroplane. The two things are as different as an early aeroplane is from a modern air liner. The model "Flying Machine" bears only the most general resemblance to an actual Aeroplane. That is to say, it possesses wings and a fuselage—but there the resemblance ends. As a natural result, the model "Flying Machine" is generally incapable of performing any predetermined evolutions or manœuvres.

FREAK PERFORMANCES

The liberties taken in the design of these non-scale model "Flying Machines" aim at giving freak performances. By 'freak,' I mean, flying performances which have no relation to actual flying evolutions by real 'planes, which fulfil no particular function and which, since they can lead to no useful flying knowledge, have no real educational value.

WHY WE CHOSE THE SCALE MODEL AEROPLANE

This being so, it seemed best to us, when first deciding which form "FROG" Aeroplanes should take, that they should be Scale Model Aeroplanes—that is, models of existing aeroplanes which can reproduce the actual evolutions of a real aeroplane. Our aeroplanes therefore, were built with rudder and elevator control in exactly the same manner as the 'full-size' aeroplane; and it is by the skilful adjustment of these controls that true-to-life flights are obtained.

TRUE-TO-LIFE FLYING—AND THE REVERSE

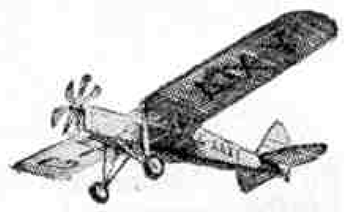
Here is an example. Automatic controls are fitted to a typical 'long-duration' model flying machine, allowing the starboard aileron to be pulled down in flight. The machine promptly stalls and goes into a spin to the right—that is to say, it performs diametrically opposite evolutions to those of an aeroplane similarly actuated (it is interesting to note that this kind of behaviour on the part of a slow-flying aeroplane, led many a Pioneer to his death). We realised, as we made our decision, that the more complicated manufacturing operations and the precision demanded by the scale model design to obviate these faults, would necessarily increase the cost of our aeroplanes. We realised, also, that they would call for the acquirement of a certain amount of skill in flying, just as training and experience is necessary for the successful handling of an actual 'plane as for playing good tennis, football or golf. Nevertheless, we held to our choice; and the fact that "FROG" Aeroplanes have obtained such a pre-eminent position in the public favour, is a justification of its soundness.

NEXT MONTH

In my article next month I shall talk about the use of a Gear-box in a scale model aeroplane. Meanwhile, you will find illustrations and prices with many details of the "FROG" Models, on the opposite page.

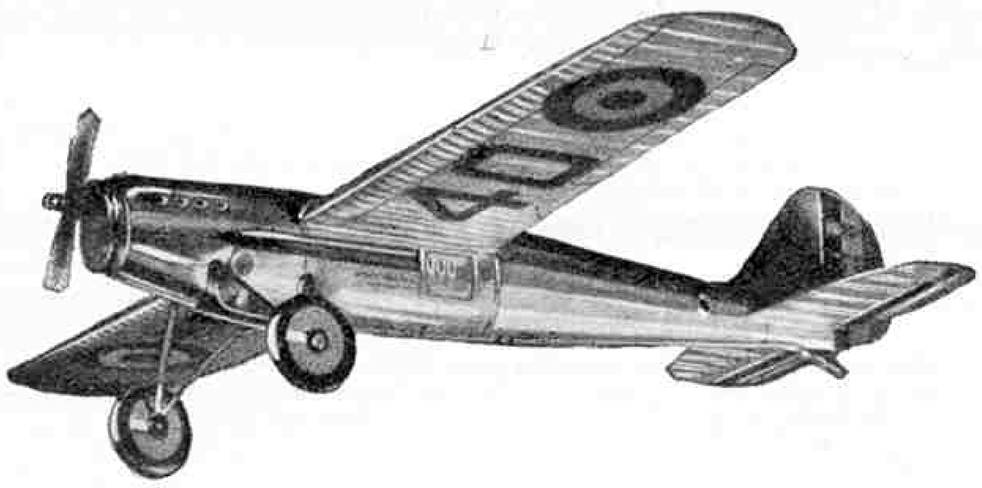
FROG TRADE MARK REGD.

FROG



The Foremost Name in Model Aviation

"FROG" INTERCEPTOR FIGHTER

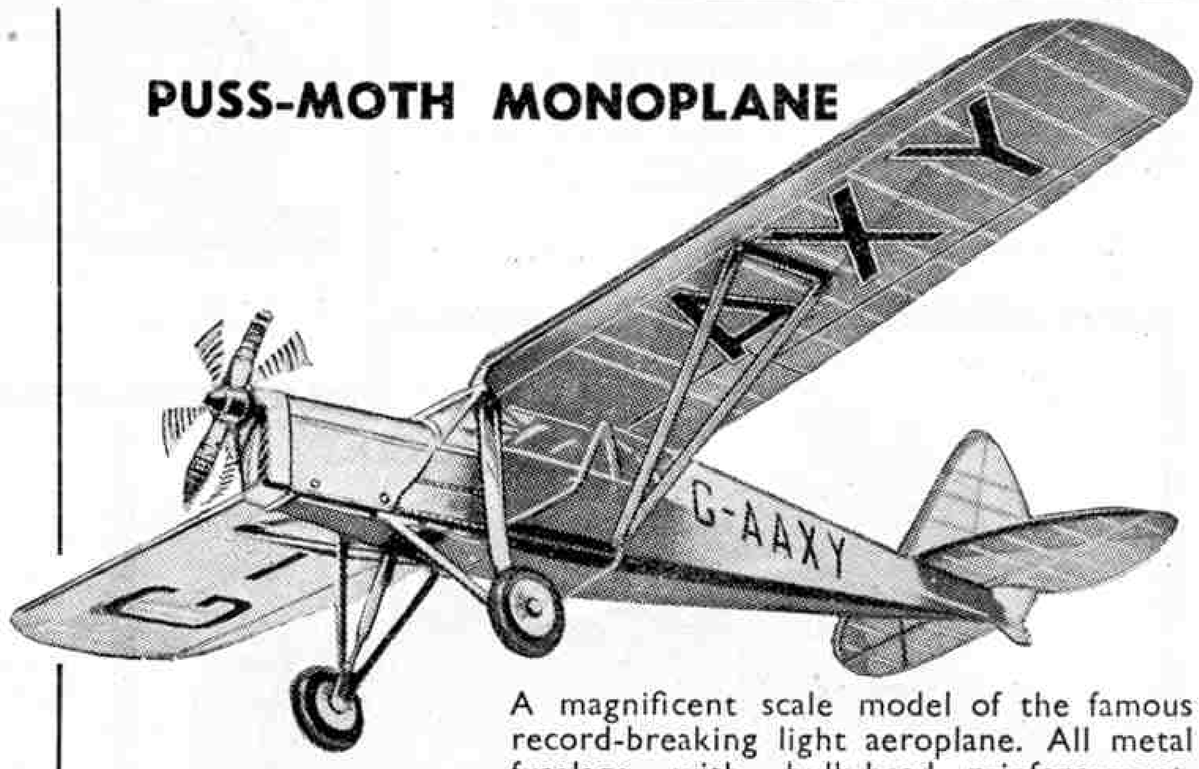


The original and now famous model. A scale model of high-speed Monoplane. Tubular construction, patented quick detachable fittings. High efficiency air-screw. A popular machine for realistic stunting. Seven models, each of handsome appearance and with the correct colours of the following nationalities: British R.A.F., France, Belgium, Holland, Italy, U.S.A. and Argentine. Price including full equipment as specified.

The "Frog" is sold complete with spare motors, lubricant and gear box oil, patent high-speed winder box and illustrated flying manual. Wing Span 11½ ins. Flies 300 ft.

7′6

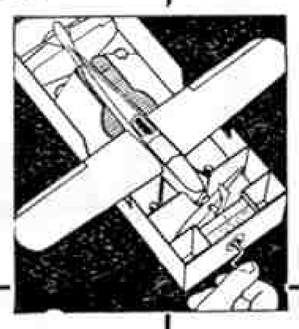
PUSS-MOTH MONOPLANE



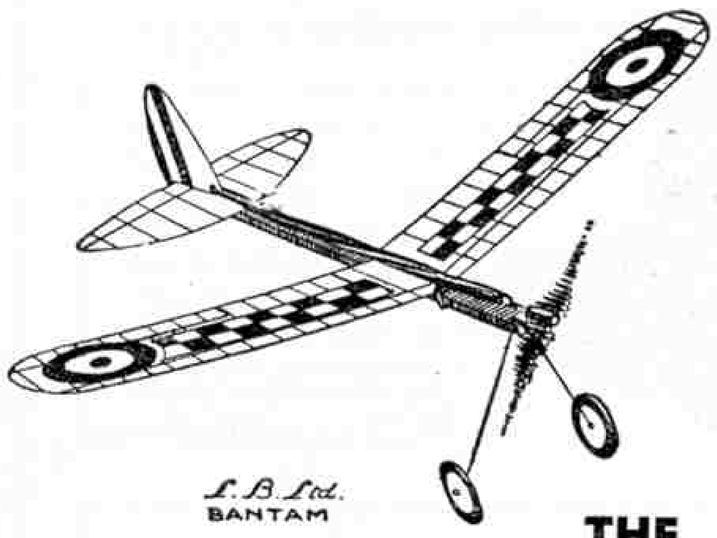
A magnificent scale model of the famous record-breaking light aeroplane. All metal fuselage with bulk-head reinforcement, hollow wings of special design and construction. Dual motor coupled to gear box, transparent cabin and roof lights. "Frog" patent quick detachable fittings and high-speed mechanical winder. The model aeroplane "par excellence." including full equipment as specified.

17′6

The Puss-Moth is sold complete with high-speed winder box, spare motor, insertor rod, gear box oil, elastic lubricant and illustrated flying manual. Wing Span 18 ins. Flies 600 ft.



For **OUTDOOR** *Flying*

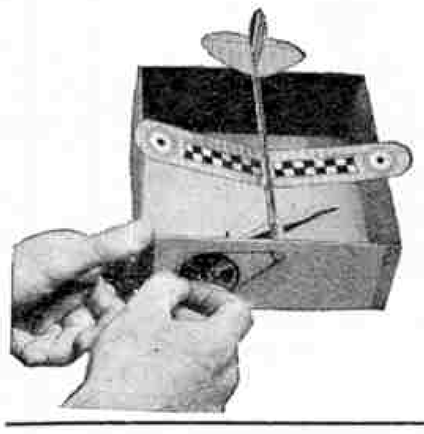


2′6

Including spare motor, lubricant, flying hints and high-speed winder-box.

WING SPAN 9 ins.
FLIES 200 ft.

L.B. Ltd. BANTAM



THE "BANTAM"

This splendid new model flies anywhere out of doors. Remarkable performance. The wings are printed in the colours of a famous squadron. Special High-Speed Winder with each model.

WILL FLY IN A WIND

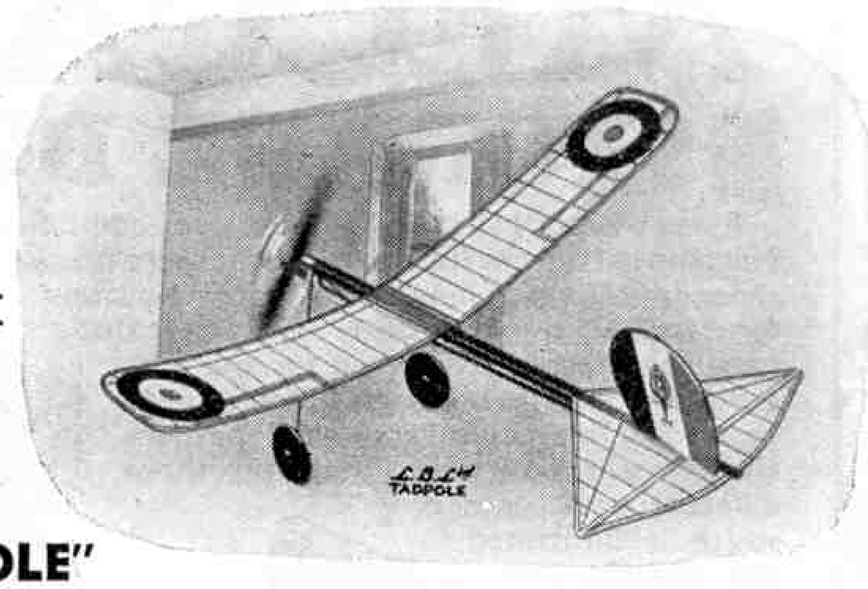
NEWS!
NEW HAWKER HART BIPLANE
Now ready **42′-**

For **INDOOR** *Flying*

2′6

Complete with high-speed winder-box and spare motor and flying hints.

WING SPAN 8 ins.
DURATION 30 secs.

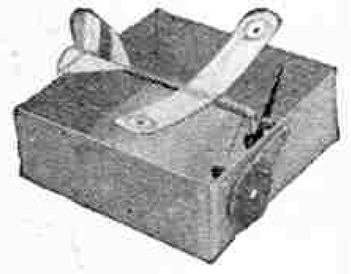


THE "TADPOLE"

NEW IDEA FOR PARTIES; hold an INDOOR Flying Meeting! Get your friends to bring along TADPOLES and arrange contests for duration flights and stunting. The aerodrome your dining table. Tadpole weighs 1/16th of ounce, no damage to ornaments.

HIGH-SPEED WINDER-BOX eliminates finger-winding.

A "TADPOLE" PARTY IS GREAT FUN!



FROG FLYING CLUB

FROG and PUSS MOTH owners are eligible for membership of the FROG Flying Club. The badges illustrated are obtainable by those members who pass proficiency tests. Write for particulars. Price 6d. each.

ON SALE AT ALL GOOD TOY SHOPS & STORES

Made in England by International Model Aircraft Ltd.

Sole Concessionaires: LINES BROTHERS LTD., TRI-ANG WORKS, LONDON, S.W.19

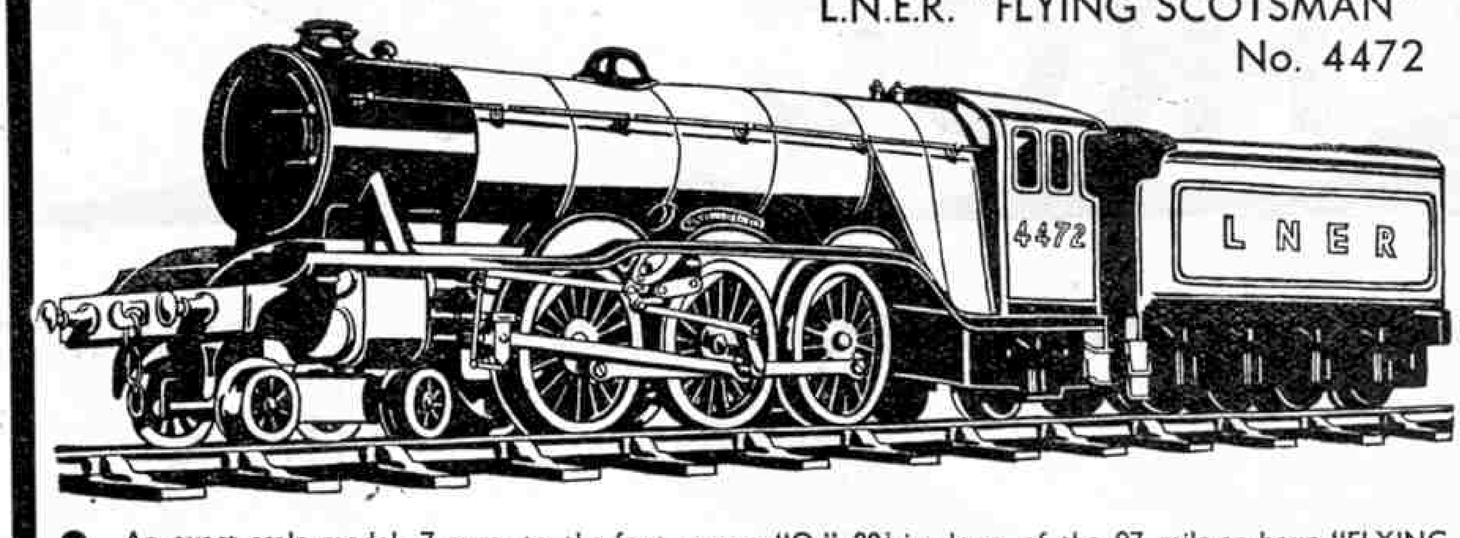
CHAMPIONS of the RAILS!

For Speed, efficiency and realism—supreme

All the excitement of driving the record-breaking L.N.E.R. Pacific is yours, if you are the possessor of this wonder model—"FLYING SCOTSMAN."

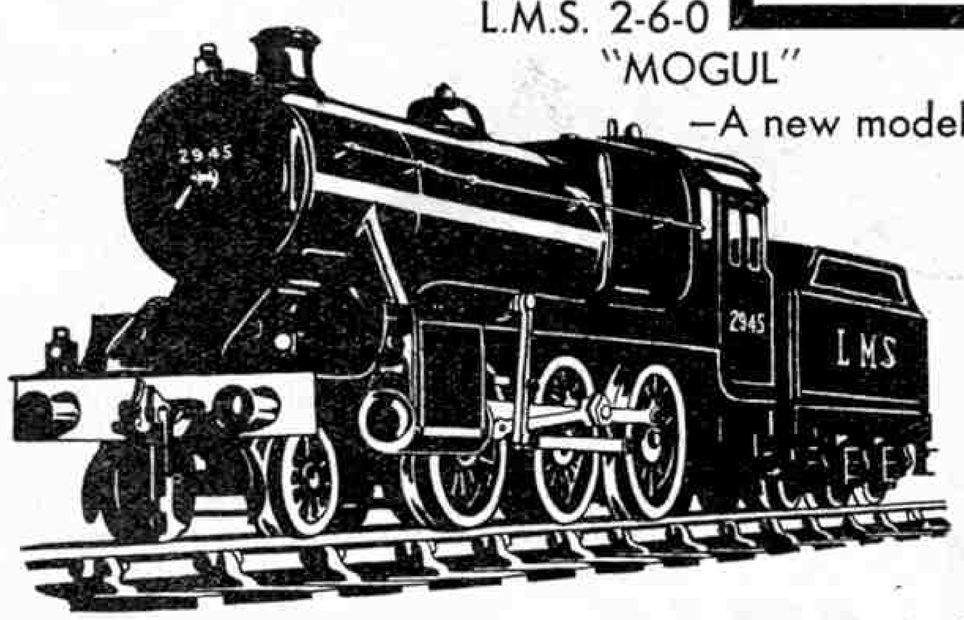
True to its champion prototype, which in November last created a new speed record for Britain by running from London to Leeds in 2 hours 31 minutes and reaching 100 m.p.h., the fastest speed ever attained by a locomotive in this country.

L.N.E.R. "FLYING SCOTSMAN" No. 4472



● An exact scale model, 7 m.m. to the foot, gauge "O," 20¼ in. long, of the 97 mile-an-hour "FLYING SCOTSMAN" herself. British made throughout and available in clockwork and electric d.c. 8-volts. Price **£4/4/–**, and electric 20 volts, a.c., price **£4/10/–**.

L.M.S. 2-6-0 "MOGUL" —A new model



● The pistons and valves of this new Stanier model are of stainless steel, and it has modified Walschaerts valve gear. 18 inches overall it is supplied in either black, or L.M.S. Red for those who wish to use it for Passenger Service. Price, steam or electric, gauge "O," **£5/5/–**.

And here's a brand new model—straight from the great locomotive works at Northampton—Stanier's latest design 2–6–0 MOGUL, fitted with double action piston valve cylinders—one of the finest gauge "O" all-British steam models yet built.

HAVE YOU HAD YOUR COPY of the NEW BASSETT-LOWKE MODEL RAILWAY CATALOGUE? Not since the war have there been so many new fascinating models in this book. Price 6d. only. **New** A.17 is a wonder book for boys.

If you have not sent for "RUN YOUR OWN TRAIN SERVICE," the new two-colour photo-gravure booklet Bassett-Lowke have just produced, write for it this moment! Just send a 1d. stamp for postage and ask for Free Booklet No. 17.

If you live near London, Northampton or Manchester, there is a great chance for you. Call in at the BASSETT-LOWKE shops there and actually **see** the models.

BASSETT-LOWKE LTD. NORTHAMPTON

London: 112, High Holborn, W.C.1.
Manchester: 28, Corporation St.

MECCANO STORAGE BOXES

Almost every Meccano boy purchases additional Meccano parts from time to time, but there is sometimes difficulty in finding suitable accommodation for them. We supply strongly made boxes that have been specially designed for the purpose, enabling extra parts to be stored neatly and methodically so that they are always easily accessible. There are three different sizes, each of which is illustrated and described here.





No. 1 STORAGE BOX

This Storage Box is attractively finished in colour, and is fitted with partitions. Two special snap fasteners are used to secure the lid instead of the lock and key shown in the illustration.

Dimensions: Length 15½ ins. Width 8¾ ins. Depth 2¾ ins. Price **6/—**

No. 2 STORAGE BOX

No. 2 Storage Box is tastefully finished in red. The partitioned tray with which it is fitted enables a large quantity of parts to be accommodated.

Dimensions: Length 14½ ins. Width 11 ins. Depth 3¾ ins. Price **10/—**

No. 3 STORAGE BOX

No. 3 Storage Box is a perfect receptacle for Meccano parts, strongly made and attractively finished in red. It is fitted with two brass handles, and the lid is secured by means of two snap fasteners. Two partitioned trays are included, as shown in the illustration.

Dimensions: Length 20 ins. Width 14 ins. Depth 5½ ins. Price **20/—**

MANUFACTURED BY

MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

Hamleys News

Estd 1760 · HAMLEY · BROTHERS · LTD

200-202, REGENT ST., LONDON, W.1
ONLY ADDRESS NO BRANCHES

Number Twenty-one *January, 1935*

Full particulars of Model Boat Power Units sent on request.

MODEL BOAT FITTINGS

Hamleys have a full range of hulls for the amateur boat builder. Built up or carved to your own specification. These fittings listed below will enable you to make a boat of which you will be proud.

Make your boat correct in every detail with Hamleys Model Boa Fittings.

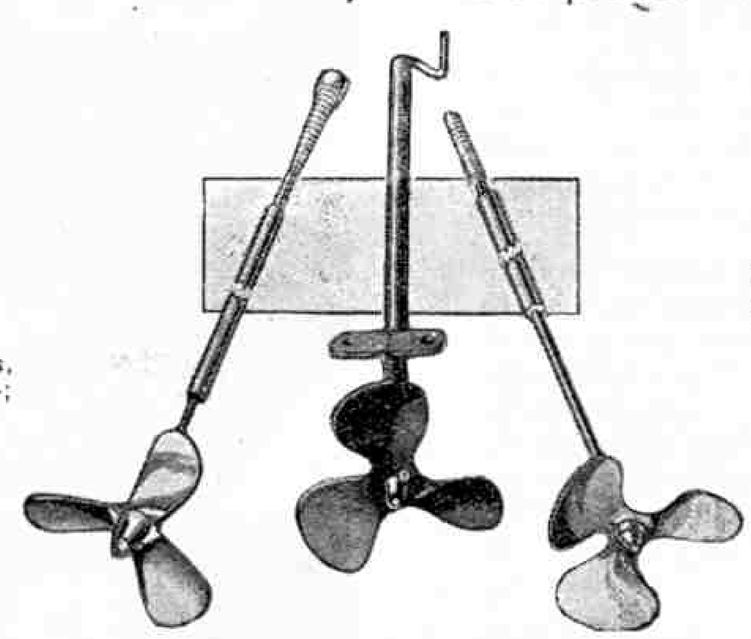


CAPSTANS, Wood, each **9**d.

CAPSTANS, Brass, each **1/6** & **2/—**



VENTILATORS, Brass, each 1″ **9**d.; 1¼″ **1/—**; 1½″ **1/6**; 1¾″ **2/—**



SHAFTS AND PROPELLERS

PROPELLER, SHAFT and TUBE. Shaft 9¾″ in length, fitted with a 3-bladed propeller, flexible spring coupling. For use with the S.T. Steam Plant. Price **2/6**

BASSETT-LOWKE. Specially constructed propeller, shaft, and tube, fitted with cast support, suitable for use with the "Isis" Motor. Price **1/6**

BRASS PROPELLER. Complete with tube and shaft. Suitable for use with the Hamley Motor. Price **2/3**

PROPELLERS. 3-bladed, right or left, each 1½″ **1/6**; 2″ **2/6**; 2¼″ **3/—**; 2½″ **3/6**



BINNACLES, with compass, Brass, each **2/6**

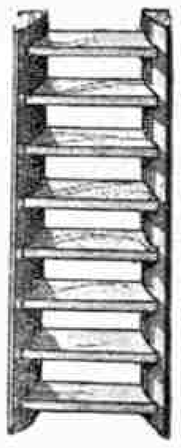


BUCKETS, Wood, each **10**d.

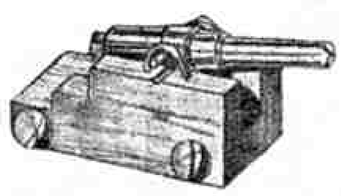


SEARCHLIGHTS, each 1″ **3/9**; 1¼″ **4/9**; 1½″ **5/9**

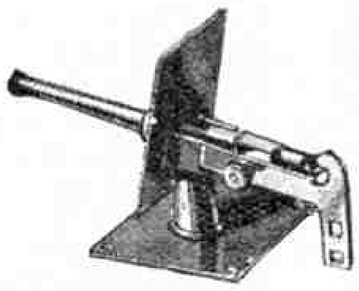
SEARCHLIGHTS, Dummy, each **1/6**



LADDERS, Wood. ½″, ⅝″, ¾″ and 1″ widths, per doz. steps **1/9**



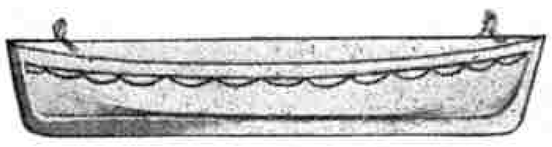
CANNONS, Mounted, each **10**d.



GUNS, Quick-firing, each **3/—** & **4/6**

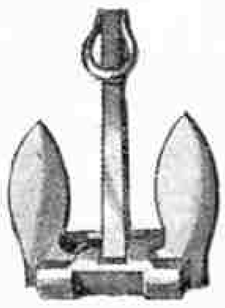


STEERING WHEELS, Brass, each **2/—** & **3/—**

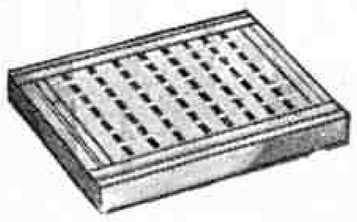


LIFEBOATS, 2″ to 3″ **2/3**; 3½″ to 4½″ ... ... each **3/—**

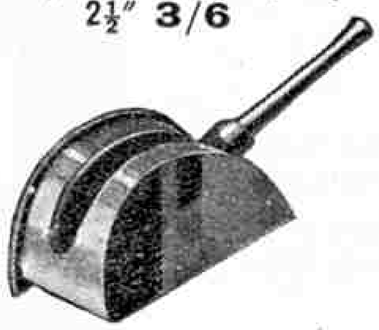
LIFEBOATS, Dummy, each 2″ to 3″ **1/9**; 4″ **2/6**; 4½″ to 6″ **4/6**



ANCHORS, Byers, each 1″ **3/9**; 2″ **4/9**



GRATINGS, 1 $\frac{5}{16}$″ × $\frac{13}{16}$″ each **1/9**



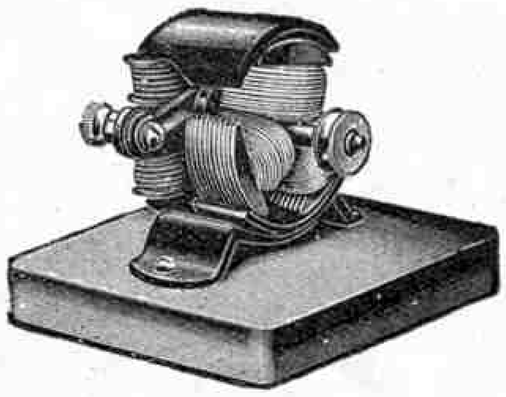
GUN IN BARBETTE each **4/—**



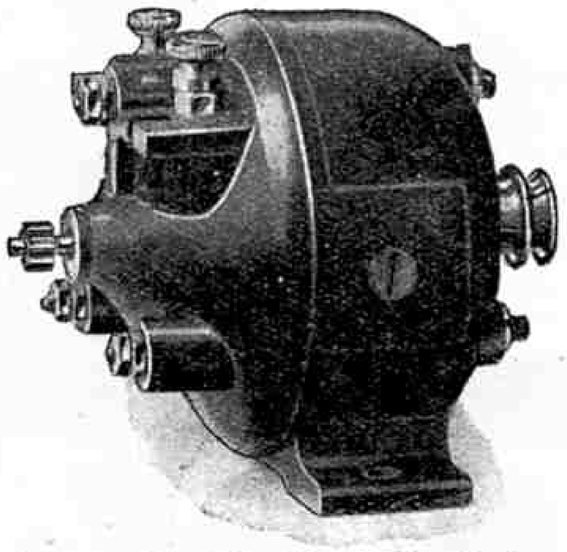
HATCHWAYS, Wood, each 1½″ **1/6**; 2″ **2/—**; 3″ **3/—**



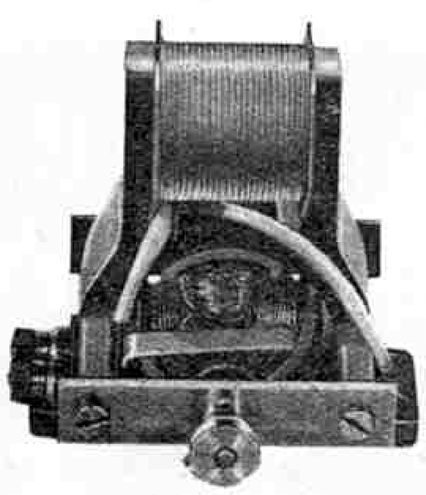
ANCHORS, Bronze, each 1″ **9**d.; 1½″ **1/—**; 2″ **1/6**



Hamley "Regent" Electric Motor. Very powerful, high revolutions, wound 2–6 volts. Perfect performance from standard 4½ volt flash lamp battery. Price (foreign) **4/6**

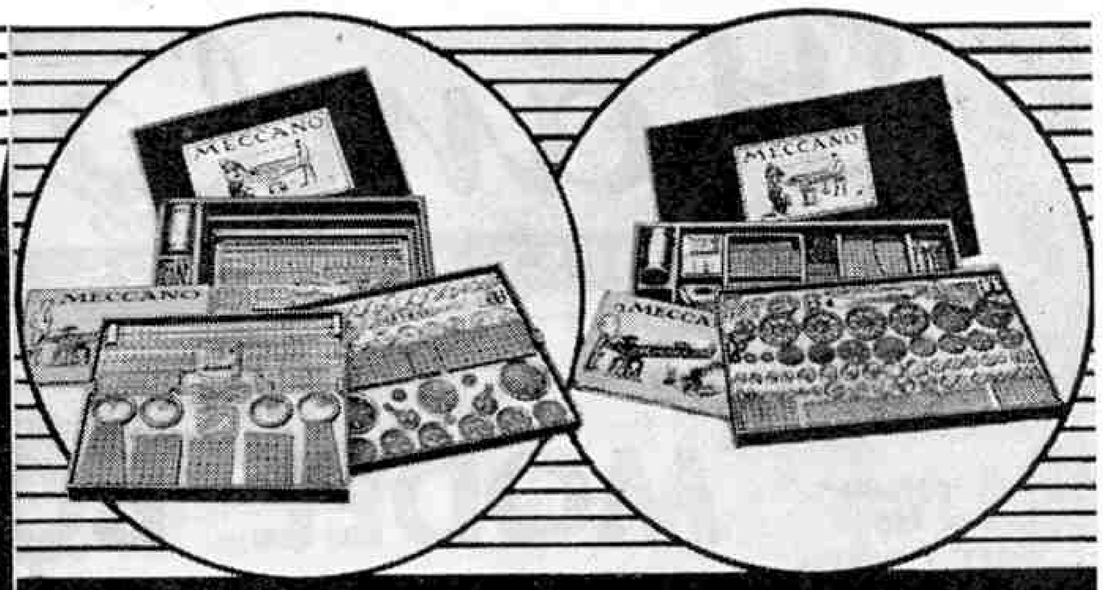


Bowman Electric Motor for 2, 4, or 6 volts, low consumption, ¾ amp. Polished bakelite casing. Twin drive (belt or gear). Price **8/6**

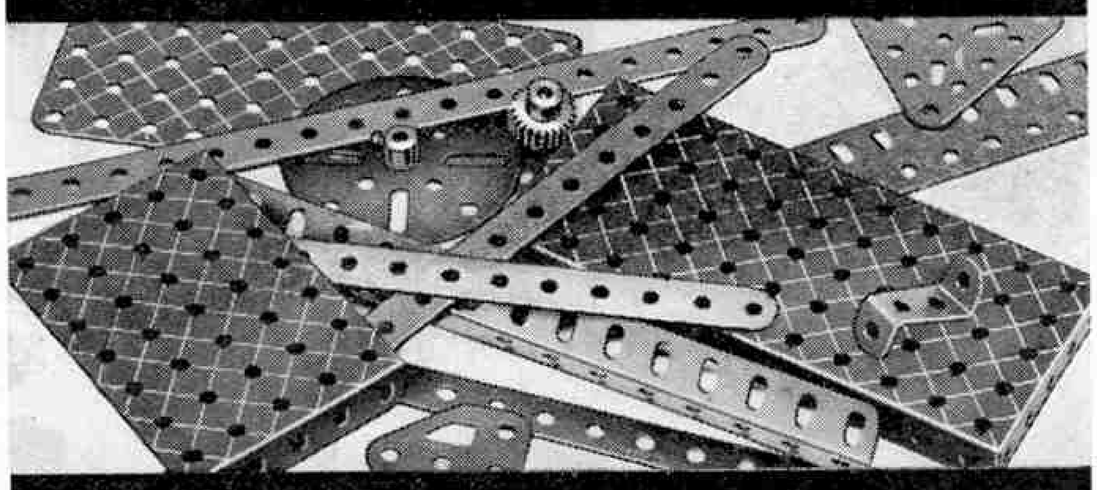


Hamley Electric Motor. To work from 4–6 volt battery. Weight 8½ ozs. Price **10/6**

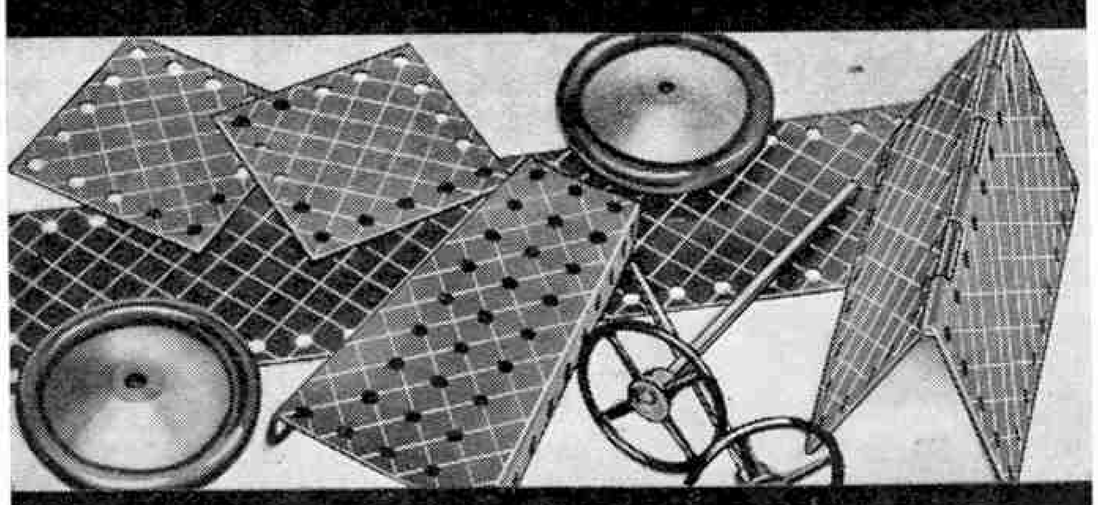
NEW



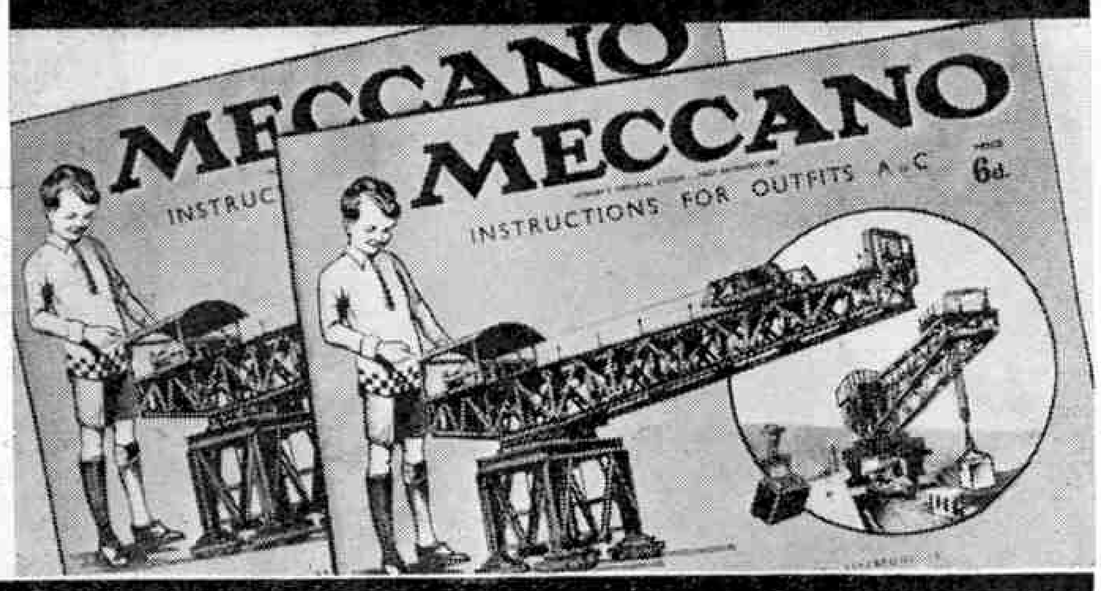
COLOURS



PARTS



MANUALS



Brighter and Better!

The New Meccano is having a most enthusiastic reception from boys. Of all the wonderful improvements that have ever been made in the Meccano System, those that have been made this season are the most stupendous and the most thrilling—NEW COLOURS, NEW PARTS and NEW MANUALS.

The New Meccano is finished in a striking colour combination of Blue and Gold, and the models constructed with it are of a brilliance never before attainable. In addition, the scope of the Outfits is greatly increased by the inclusion of new and specially designed parts. Among these are Strip Plates, intended primarily for filling in purposes; Hinged Flat Plates that simplify completely the problem of roof structures; Flexible Plates made of fibre board that can be bent to almost any desired shape; and a Road Wheel and Steering Wheel that will be invaluable to builders of Motor Car models.

A magnificent new Manual of Instructions is included in each New Meccano Outfit, giving details of a large number of models that can be built, together with beautiful illustrations in half-tone.

See the New Meccano at your dealers. Take Dad with you!

Prices of Meccano Outfits and Accessory Outfits

COMPLETE OUTFITS

A	Outfit	...	... each	5/–
B	,,	...	... ,,	7/6
C	,,	...	... ,,	10/–
D	,,	...	... ,,	15/–
E	,,	...	... ,,	20/–
F	,,	...	... ,,	30/–
G	,,	...	... ,,	55/–
H	,,	(Carton)	... ,,	72/6
Hw	,,	(Cabinet)	... ,,	97/6
K	,,	(Carton)	... ,,	132/6
Kw	,,	(Cabinet)	... ,,	157/6
L	,,	...	... ,,	410/–

ACCESSORY OUTFITS

Aa	converts	A	Outfit	into	B each	2/6
Ba	,,	B	,,	,,	C ,,	3/–
Ca	,,	C	,,	,,	D ,,	5/6
Da	,,	D	,,	,,	E ,,	5/6
Ea	,,	E	,,	,,	F ,,	11/–
Fa	,,	F	,,	,,	G ,,	26/6
Ga	,,	G	,,	,,	H ,,	17/6
Ha	,,	H	,,	,,	K ,,	60/–
Ka	,,	K	,,	,,	L ,,	225/–

There's a wonderful new Meccano Book in colours that tells you all about the New Meccano and other Meccano Products.

Get a copy from your dealer to-day, price 2d. If you have any difficulty, send 3½d. direct to us, and a copy will be sent to you, post free.

Meccano Limited Binns Road Liverpool 13

If you wish you can still obtain Meccano Outfits and Parts with the Red-Green finish.

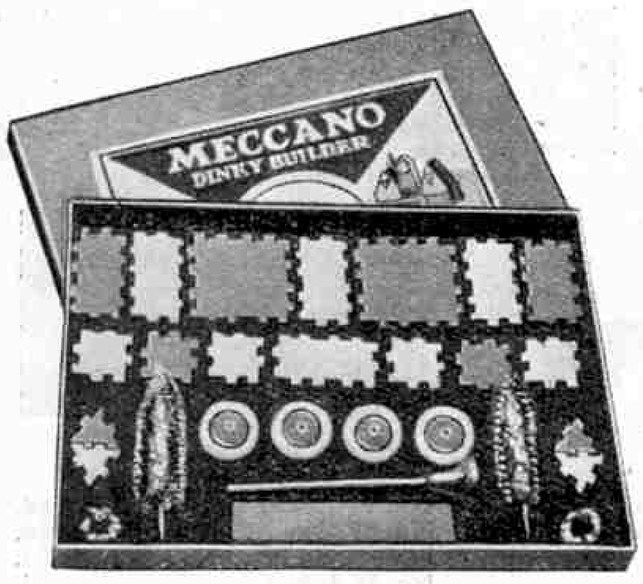
The new MECCANO

MECCANO DINKY BUILDER

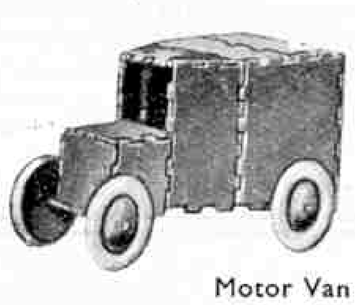
A Fascinating Building Hobby for Girls and Boys

The new Meccano Dinky Builder, the latest thrill from Meccanoland, is a fascinating constructional toy specially designed for younger boys and girls. The parts, tastefully enamelled in jade green and salmon pink, are fitted together in the most simple and ingenious manner without the use of any nuts and bolts, giving results that are attractive and of exceptional interest. Two Outfits are available: No. 1 for general construction, including wheel toys, and No. 2 for making groups of miniature furniture. Your dealer will be pleased to show you these new Meccano Dinky Builder Outfits.

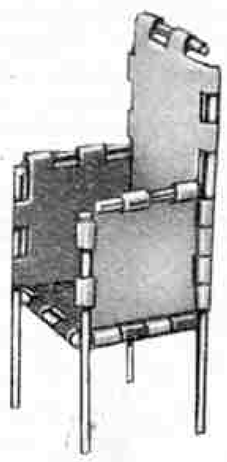
Manufactured by Meccano Limited, Binns Road, Liverpool 13.



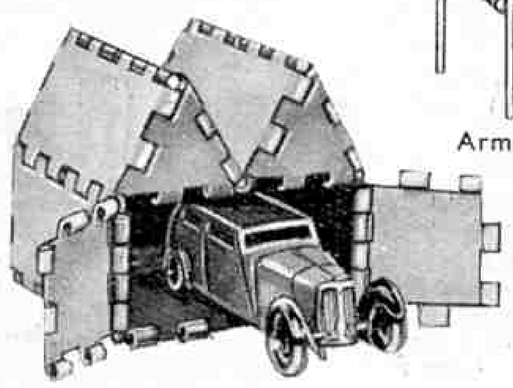
No. 1 Dinky Builder Outfit



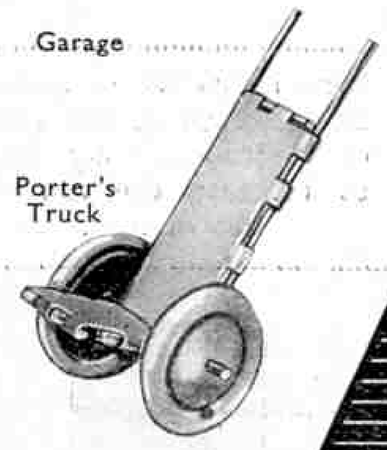
Motor Van



Arm Chair



Garage



Porter's Truck



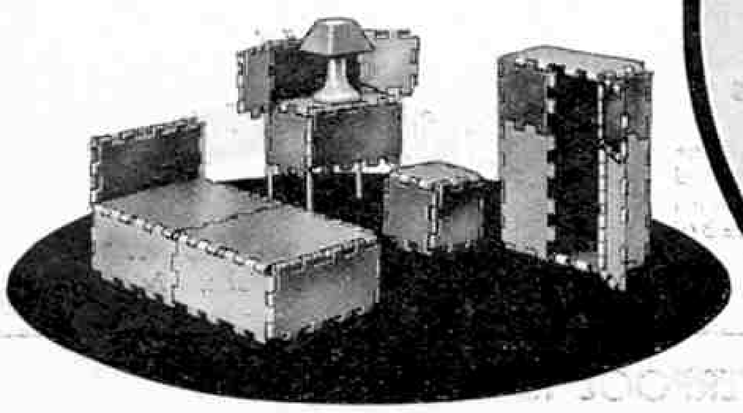
No. 2 Dinky Builder Outfit

No. 1 DINKY BUILDER OUTFIT

This Outfit contains a good selection of parts with which a large number of models can be made. It includes two trees on die-cast stands that lend the correct atmosphere to models of farm buildings, churches, etc. A further attraction are the wheels, finished in blue with white tyres, for constructing miniature wheel toys. The beautifully coloured instruction leaflet included in the Outfit illustrates a total of 44 models that any boy or girl can build. Price **5/-**

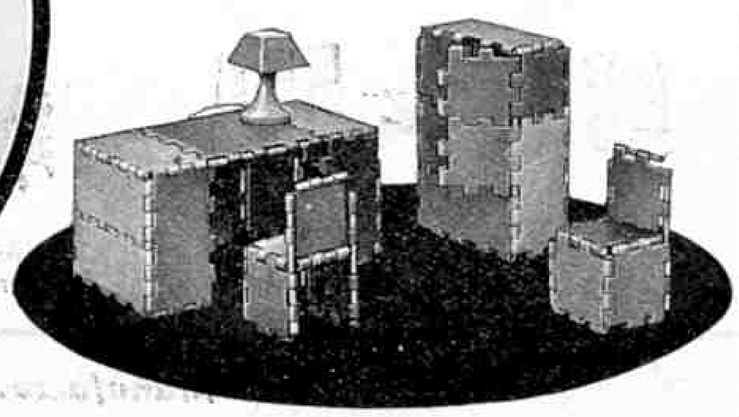
No. 2 DINKY BUILDER OUTFIT

The No. 2 Dinky Builder Outfit contains a wide selection of parts primarily intended for the construction of realistic groups of miniature modern furniture. The small table lamp and shade that are included add greatly to the realism of these groups, particularly as the lamp can be lighted from an ordinary flash lamp battery. The coloured instruction leaflet gives examples of 7 furniture groups, but to an enthusiastic model builder the possibilities of the Outfit are practically inexhaustible. Price **7/6**



Group of Bedroom Furniture made with No. 2 Outfit.





Group of Office Furniture made with No. 2 Outfit.

MECCANO

DINKY TOYS

Toys of Quality

The Best that you can buy

150 Varieties

Meccano Dinky Toys are the most realistic and the most attractive models in miniature ever produced.

One of the most important additions recently made is the scale model of the Cunard White Star Liner "Queen Mary" (Meccano Dinky Toys No. 52, see page opposite). This is a magnificent model of the world's largest liner.

Many of these toys are ideal for giving the finishing touch to your model railways. You must have railwaymen to deal with your trains, and passengers to travel in them; car attendants to look after the passengers, and engineers for the maintenance of the railway and its equipment. You want farmyard animals for lineside fields, and you should have at least one of the famous "Hall's Distemper" advertisements alongside your line.

Then there are the miniature train sets, rail car and various other types of motor vehicle. You can have hours of fun running these on the table or on the floor, arranging road and rail transport services from one point to another.

These splendid toys can all be purchased separately at the prices shown, or they can be obtained in complete sets. Ask your dealer to show you the complete range of Meccano Dinky Toys.



Meccano Dinky Toys No. 1

STATION STAFF

No. 1a	Station Master	each 3d.
No. 1b	Guard	,, 3d.
No. 1c	Ticket Collector	,, 3d.
No. 1d	Driver	,, 3d.
No. 1e	Porter with bags	,, 3d.
No. 1f	Porter	,, 3d.

Price of complete set 1/6

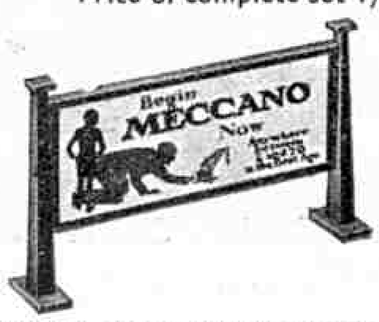


Meccano Dinky Toys No. 4

ENGINEERING STAFF

No. 4a	Electrician	each 3d.
No. 4b	Fitters	,, 3d.
No. 4c	Storekeeper	,, 3d.
No. 4d	Greaser	,, 3d.
No. 4e	Engine Room Attendant ...	,, 3d.

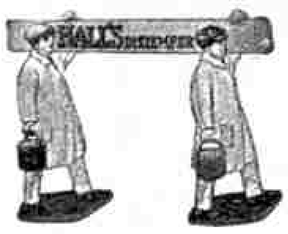
Price of complete set 1/6



STATION OR FIELD HOARDING

This is a realistic accessory, suitable for model station platforms, or for fields adjacent to the railway track.

Price 6d.



Meccano Dinky Toys No. 13

HALL'S DISTEMPER ADVERTISEMENT

This miniature of a well-known lineside advertisement is intended to be placed in the fields adjoining a model railway track. Price 9d.

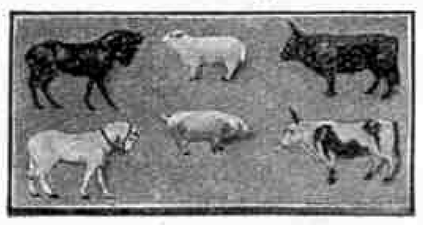


Meccano Dinky Toys No. 6

SHEPHERD SET

No. 6a	Shepherd ...	each 3d.
No. 6b	Dog	,, 2d.
No. 2d	Sheep	,, 2d.

Price of complete set 1/–



Meccano Dinky Toys No. 2

FARMYARD ANIMALS

No. 2a	Horse ...	each 3½d.
No. 2b	Cow	,, 3½d.
No. 2c	Pig	,, 2d.
No. 2d	Sheep	,, 2d.

Price of complete set 1/6



Meccano Dinky Toys No. 5

TRAIN AND HOTEL STAFF

No. 5a	Pullman Car Conductor ...	each 3d.
No. 5b	Pullman Car Waiters	,, 3d.
No. 5c	Hotel Porters	,, 3d.

Price of complete set 1/3



Meccano Dinky Toys No. 3

PASSENGERS

No. 3a	Woman and Child	each 3d.
No. 3b	Business Man	,, 3d.
No. 3c	Male Hiker	,, 3d.
No. 3d	Female Hiker	,, 3d.
No. 3e	Newsboy	,, 3d.
No. 3f	Woman	,, 3d.

Price of complete set 1/6

New items are constantly being added to the series of Meccano Dinky Toys, to increase the fun and fascination.



Meccano Dinky Toys No. 17

PASSENGER TRAIN SET

No. 17a	Locomotive	each 9d.
No. 17b	Tender	,, 5d.
No. 20a	Coach	,, 7d.
No. 20b	Guard's Van	,, 7d.

Price of complete set 2/3

Ready shortly



Meccano Dinky Toys No. 18

GOODS TRAIN SET

No. 21a	Tank Locomotive	each 9d.
No. 21b	Wagons	,, 4d.

Price of complete set 1/9

Ready shortly



RAILWAY ACCESSORIES No. 7

Watchman's Hut, Brazier, Shovel and Poker. Price 1/3



Meccano Dinky Toys No. 19

MIXED GOODS TRAIN SET

No. 21a	Tank Locomotive	each 9d.
No. 21b	Wagon	,, 4d.
No. 21d	Petrol Tank Wagon	,, 6d.
No. 21e	Lumber Wagon	,, 5d.

Price of complete set 1/11



Meccano Dinky Toys No. 20

PASSENGER TRAIN SET

No. 21a	Tank Locomotive	each 9d.
No. 20a	Coaches	,, 7d.
No. 20b	Guard's Van	,, 7d.

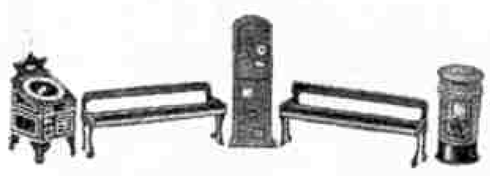
Price of complete set 2/6



RAILWAY ACCESSORIES No. 2

Milk Cans and Truck.

Price per set 1/3



RAILWAY ACCESSORIES No. 3

Platform Machines, etc. Price 1/6

RAILWAY ACCESSORIES No. 4

This set comprises all the pieces that are contained in Railway Accessories Nos. 1, 2 and 3. Price 3/9



RAILWAY ACCESSORIES No. 1

Miniature Luggage and Truck. Price 1/–

Manufactured by MECCANO LTD., Binns Road, LIVERPOOL 13

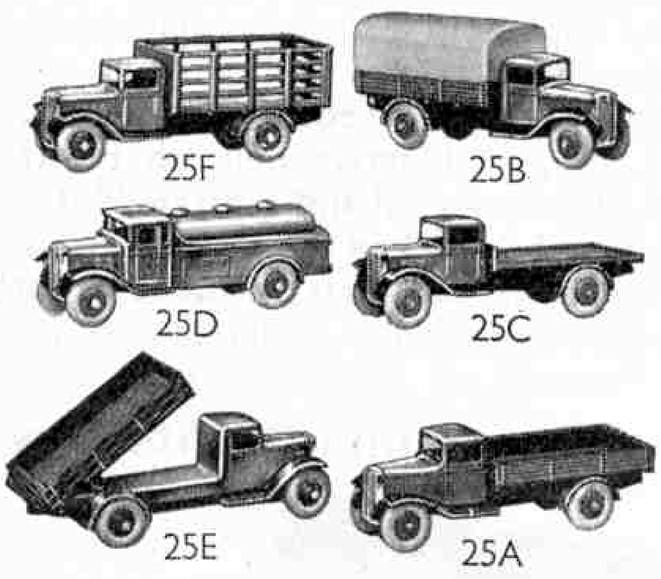
MECCANO

Made of the finest materials

DINKY TOYS

A fascinating collecting hobby

150 Varieties



Meccano Dinky Toys No. 25
COMMERCIAL MOTOR VEHICLES
Fitted with rubber tyres and silver-plated radiators.

No. 25a	Wagon	each	9d.
No. 25b	Covered Van	,,	9d.
No. 25c	Flat Truck	,,	9d.
No. 25d	Petrol Tank Wagon ...	,,	9d.
No. 25e	Tipping Wagon	,,	9d.
No. 25f	Market Gardener's Van	,,	9d.

Price of complete set 4/6



Meccano Dinky Toys No. 24
MOTOR CARS
Fitted with rubber tyres and silver-plated radiators.

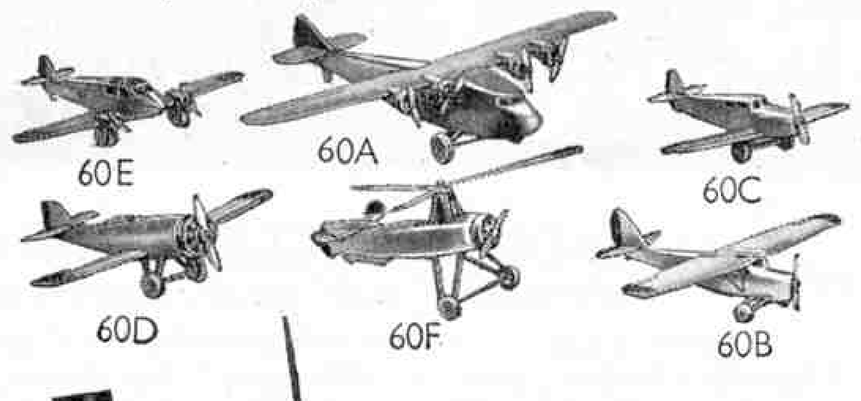
No. 24a	Ambulance	each	9d.	No. 24e	Super Streamline Saloon	each	9d.
No. 24b	Limousine	,,	9d.	No. 24f	Sportsman's Coupé ...	,,	9d.
No. 24c	Town Sedan	,,	1/-	No. 24g	Sports Tourer (4 seater)	,,	1/-
No. 24d	Vogue Saloon	,,	9d.	No. 24h	Sports Tourer (2 seater)	,,	1/-

Price of complete set 6/6

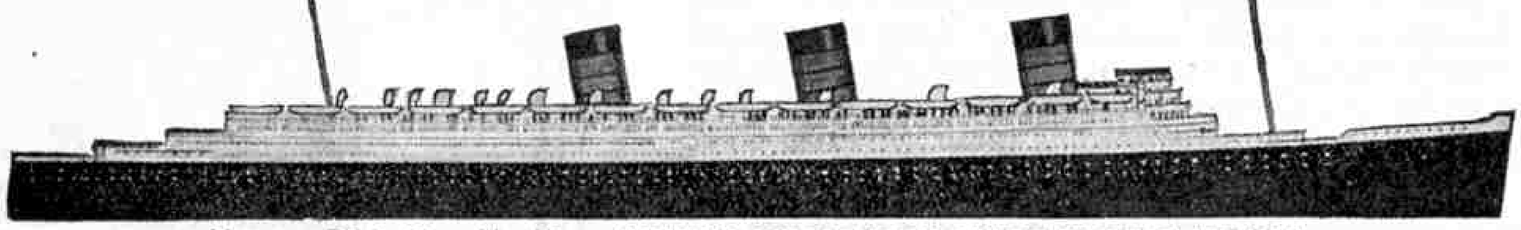
Meccano Dinky Toys No. 60
AEROPLANES

No. 60a	Imperial Airways Liner	each	9d.
No. 60b	D.H. "Leopard Moth" ...	,,	6d.
No. 60c	Percival "Gull"	,,	6d.
No. 60d	Low Wing Monoplane ...	,,	6d.
No. 60e	General "Monospar" ...	,,	6d.
No. 60f	Cierva "Autogiro" ...	,,	6d.

Price of complete set 3/-



PRODUCT of MECCANO LIMITED LIVERPOOL

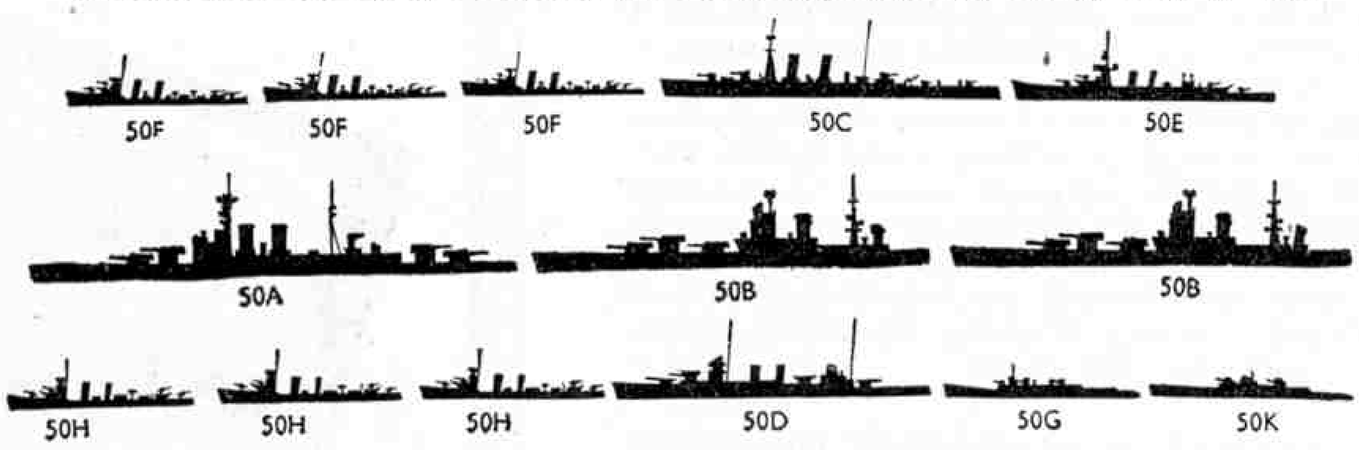


Meccano Dinky Toys No. 52 **CUNARD WHITE STAR LINER "QUEEN MARY"**
A scale model of the World's largest ocean liner. Price 1/- each

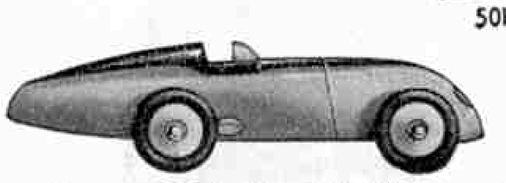
Meccano Dinky Toys No. 52a. Exactly as No. 52, but fitted with roller wheels. Price 1/- each

PRODUCT of MECCANO LIMITED LIVERPOOL

Finished in Bright Colours



Realistic and Attractive Models



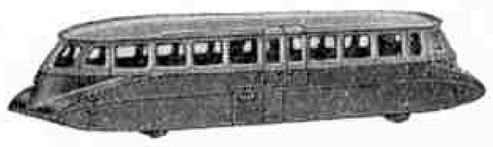
Meccano Dinky Toys No. 23
RACING CAR
Assorted Colours. Fitted with rubber tyres. Price 6d. each

Meccano Dinky Toys No. 50
SHIPS OF THE BRITISH NAVY

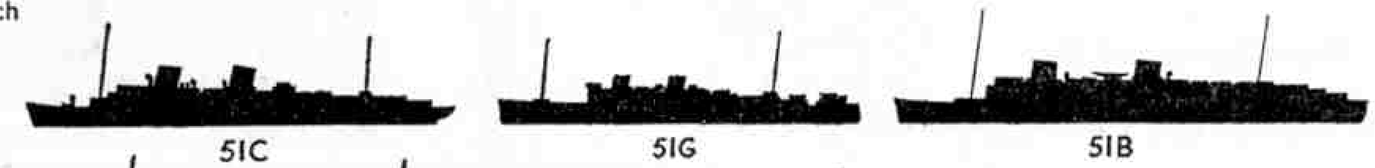
No. 50a	Battle Cruiser "Hood" ...	each	9d.	No. 50e	Cruiser "Delhi"	each	4d.
No. 50b	Battleships, "Nelson" Class (2)	,,	6d.	No. 50f	Destroyers, "Broke" Class (3)	,,	1d.
No. 50c	Cruiser "Effingham" ...	,,	4d.	No. 50g	Submarine, "K" Class ...	,,	1d.
No. 50d	Cruiser "York"	,,	4d.	No. 50h	Destroyers, "Amazon" Class (3)	,,	1d.

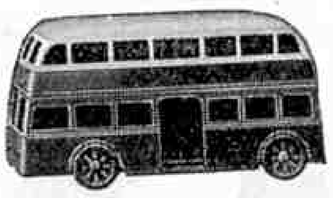
No. 50k Submarine, "X" Class ... each 1d.

Price of complete set 3/6



Meccano Dinky Toys No. 26
G.W.R. RAIL CAR
Assorted Colours. Price 6d. each





Meccano Dinky Toys No. 29
MOTOR BUS
Assorted Colours. Price 6d. each

Meccano Dinky Toys No. 51
FAMOUS LINERS

No. 51b	"Europa"	...	each 9d.	No. 51e	"Strathaird"	...	each 6d.
No. 51c	"Rex"	...	,, 9d.	No. 51f	"Queen of Bermuda" ...	...	,, 6d.
No. 51d	"Empress of Britain"	...	,, 8d.	No. 51g	"Britannic"	...	,, 6d.

Price of complete set 3/6



Meccano Dinky Toys No. 27
TRAM CAR
Assorted Colours. Price 6d. each

Manufactured by MECCANO LTD., Binns Road, LIVERPOOL 13



ELECTRICITY ! ! !

THE MOST WONDERFUL FORCE OF THE AGE

Commence experimenting in this fascinating Science to-day, and gain a knowledge of the electrical mechanisms that play such an important part in our daily life.

The Meccano Elektron Outfits provide you with all that is necessary for a splendid series of experiments in magnetism, frictional electricity and current electricity. They contain the parts required to construct a Reading Lamp, an Electric Bell, an Electric Telegraph, a Shocking Coil and Electric Motors, all of which may be worked from a Bichromate Cell built up from materials included. Both Outfits contain a specially written and fully illustrated Manual of Instructions.

Get one of these fine Outfits now



No. 1 Meccano Elektron Outfit Price 6/6



No. 2 Meccano Elektron Outfit Price 21/-

No. 1 MECCANO ELEKTRON OUTFIT

Magnetism and Static Electricity

The No. 1 Outfit contains two powerful Bar Magnets and a reliable Magnetic Compass, together with everything necessary for the carrying out of a series of fascinating magnetic experiments. In addition there are materials for experiments in frictional or static electricity, and for the construction of an Electric Compass and two forms of Electroscope. There are also parts for making a useful Reading Lamp. Price **6/6**

No. 2 MECCANO ELEKTRON OUTFIT

Magnetism, Static and Current Electricity

The No. 2 Elektron Outfit contains all that is included in the No. 1 Elektron Outfit, with additional parts that enable a splendid series of experiments in current electricity to be performed. Among these parts are a Horseshoe Magnet, and Coils and Yokes for the construction of Electro-Magnets that can be used in building a real Electric Bell, and a Buzzer for use in an electric telegraph system. A specially-wound coil and other necessary parts are supplied for assembling into a splendid Shocking Coil that will give hours of fun and excitement; and from other components two different working Electric Motors can be built. Electroplating is among the other fascinating experiments that can be performed with this Outfit. Price **21/-**

No. 1a MECCANO ELEKTRON ACCESSORY OUTFIT

An Accessory Outfit is also available that converts a No. 1 Elektron Outfit into a No. 2. Price **14/6**

The parts included in the Meccano Elektron Outfits can be obtained separately. Ask your dealer for the Elektron Folder giving a list of Elektron parts, or write for a copy to the address below.

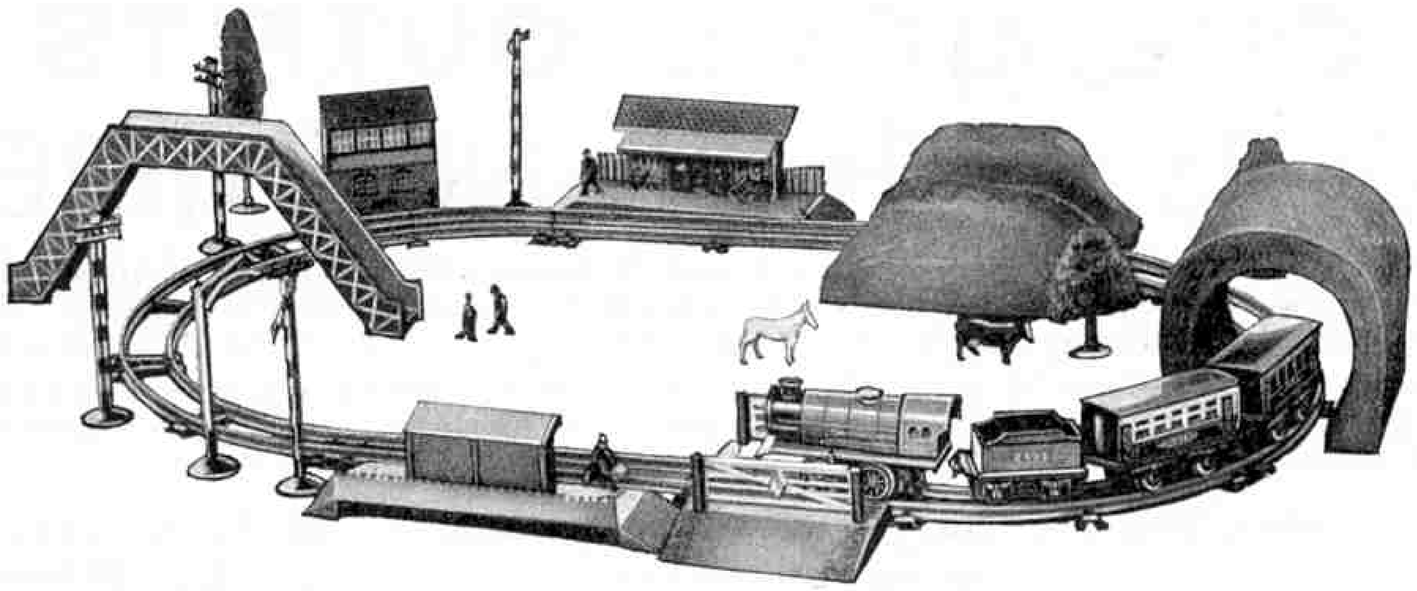
Manufactured by

MECCANO LTD., Binns Road, Liverpool 13

MECCANO ELEKTRON

HORNBY
COMPLETE MODEL RAILWAY SETS

The Complete Model Railway Sets illustrated on this page are interesting additions to the popular Hornby M range. Each Set includes an efficient clockwork Locomotive, various items of Rolling Stock, a Set of Rails, and Lineside Accessories.



All you have to do is to unpack the box, lay out the rails and accessories as shown in the illustration provided, place the locomotive and coaches or wagons on the track, and commence operating your own railway immediately. It's great fun!

This illustration shows a suitable arrangement of the M10 Complete Model Railway Set

M8 Complete Model Railway

This Model Railway Set consists of a non-reversing Locomotive, Tender and two Goods Wagons, Wayside Station, Footbridge, Signal, Signal Cabin, two Poplar Trees with Stands, Tunnel and Set of Rails. The complete Set is packed in a strong carton, as illustrated. Price 9/6

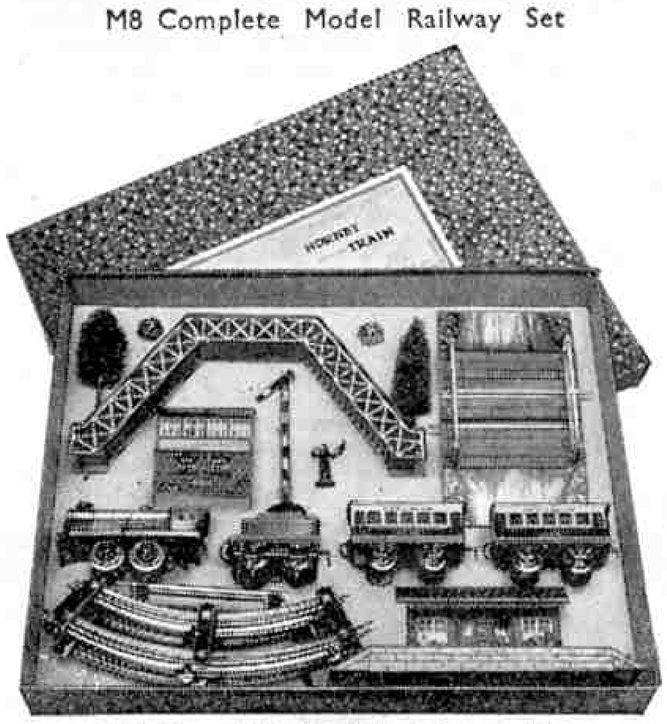
M10 Complete Model Railway

This is a more comprehensive Railway Set, consisting of a non-reversing Locomotive, with a reliable mechanism that can be braked from the track, Tender, two Pullman Coaches, Set of Rails, Footbridge, two Stations, Signal Cabin, two Telegraph Poles, two Signals, Loading Gauge, Tunnel, Cutting, Level Crossing, three Trees and six die-cast Figures.

The complete Set is attractively packed in a special cabinet, as illustrated. Price 19/6



M8 Complete Model Railway Set



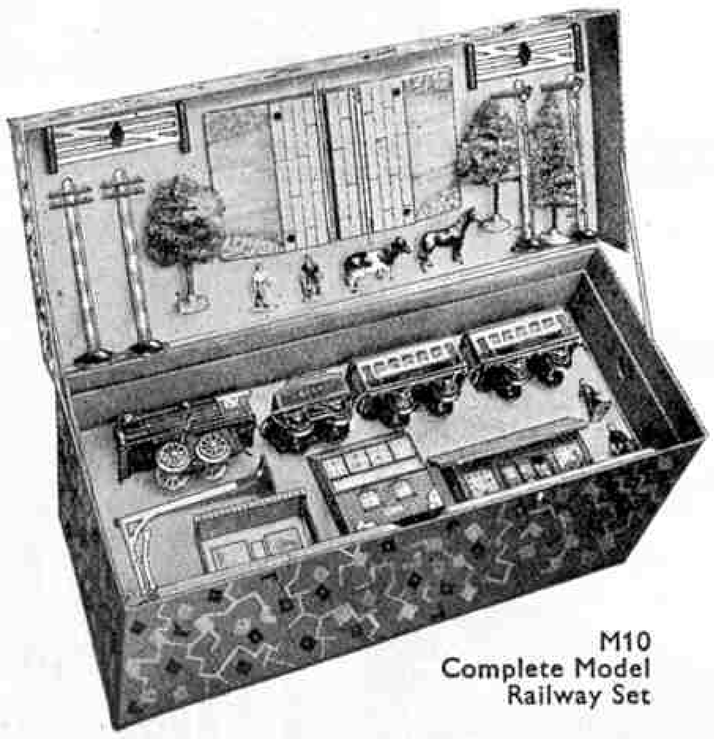
M9 Complete Model Railway Set

M9 Complete Model Railway

The M9 Complete Model Railway Set contains a comprehensive selection of material, consisting of an efficient non-reversing Locomotive, which may be braked from the track. Tender and two Passenger Coaches, Signal, Station, Footbridge, Signal Cabin, Level Crossing, Guard, two Trees with Stands, two Hikers, and Set of Rails. The complete Set is packed in a strong carton, as illustrated. Price 12/6

M11 Complete Model Railway

This Complete Model Railway Set is the most popular and the most comprehensive in the series. It consists of a reversing Tank Locomotive, Fibre Wagon, Timber Wagon, Open Wagon, Tunnel, Station, Signal, Level Crossing, Signal Cabin, Footbridge, one Cow, one Horse, two Trees with Stands, Guard, and Set of Rails. The complete Set is attractively packed in special cabinet, as illustrated. Price 25/–



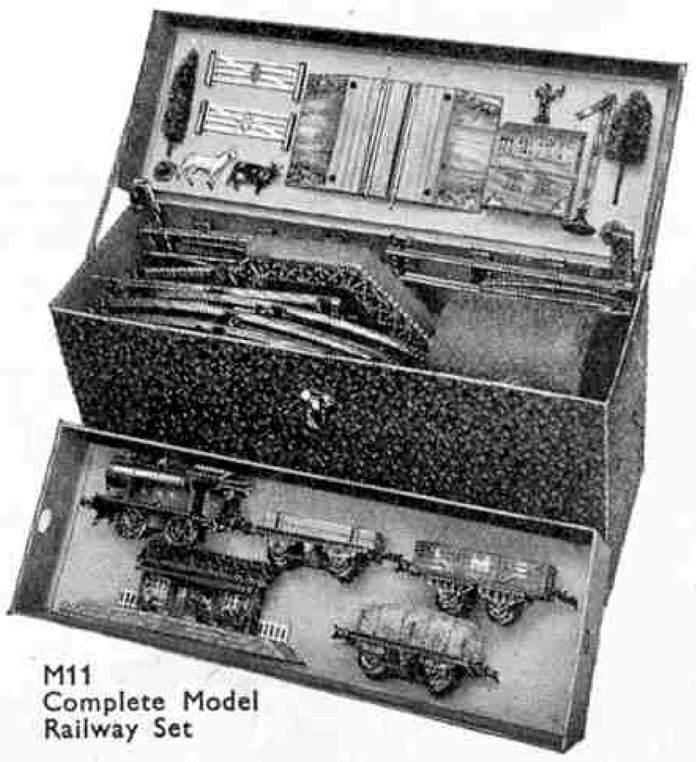
M10 Complete Model Railway Set

Obtainable from all Meccano Dealers

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MECCANO LIMITED

BINNS ROAD, LIVERPOOL 13



M11 Complete Model Railway Set

MECCANO KEMEX

CHEMICAL OUTFITS

HOURS OF FUN AND INTEREST

The Meccano Kemex Outfits contain all the apparatus and materials required for a series of fascinating chemical experiments. They provide hours of fun, and enable you to learn some of the marvels of the wonderful science of chemistry. There is no difficulty and no danger. The chemicals are all non-explosive and non-poisonous, and conform with Home Office requirements.

With these Outfits you can perform for yourself hundreds of interesting chemical experiments—from producing invisible inks and preparing gases, to making a wonderful under-water "garden" in which chemical "plants" of different colours actually grow from crystals! Every experiment is fully described in a splendidly-illustrated Manual of Instructions.

No. O Meccano Kemex Outfit

75 Experiments

This Outfit includes a supply of specially selected chemicals, together with a length of Magnesium Ribbon, sufficient to perform 75 attractive experiments. The apparatus provided includes Test Tubes, Test Tube Brush, Delivery Tubes and Corks, and a simple and highly efficient Spirit Lamp.
Price 5/–

No. 1 Meccano Kemex Outfit

130 Experiments

This Outfit includes the whole of the contents of the No. O Outfit, together with further chemicals that increase the number of experiments that can be performed to 130. The additional apparatus includes a Test Tube Holder, Glass Stirring Rod, Funnel and Filter Papers.
Price 7/6

No. 2L Meccano Kemex Outfit

250 Experiments

This Outfit includes the whole of the contents of the No. 1 Outfit, and further chemicals that increase the range of experiments up to 250. The additional apparatus includes a porcelain Evaporating Dish, Special Test Tubes, a handsome Test Tube Stand, and an Evaporating Stand including a Ring, with Wire Gauze.
Price 15/–

No. 2B Meccano Kemex Outfit

This is exactly the same as the No. 2L Meccano Kemex Outfit, except that a highly efficient Bunsen Burner, with the necessary length of rubber tubing, is included in place of the Spirit Lamp.
Price 15/–

Hundreds of interesting experiments

A fascinating hobby of endless variety.

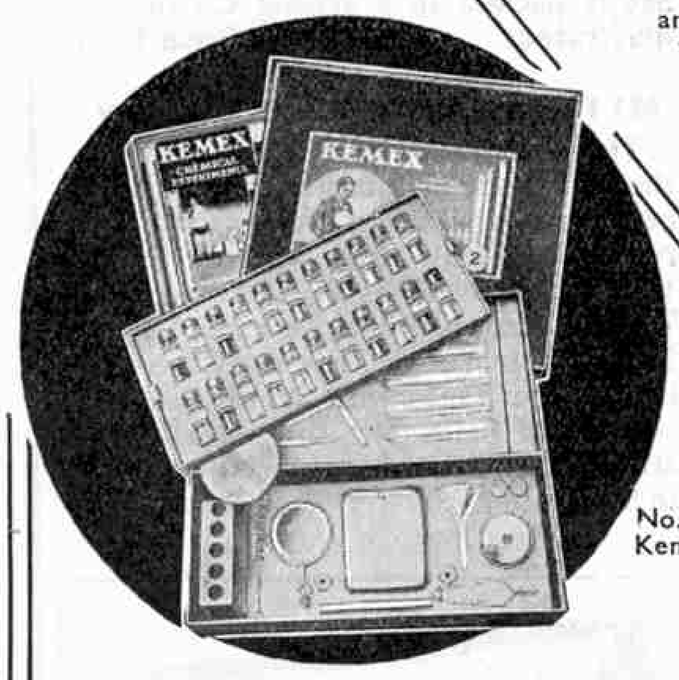
No. 3L Meccano Kemex Outfit

350-400 Experiments

This splendid Outfit provides a boy with all he requires to carry out between 350 and 400 experiments and thus enables him to acquire a sound knowledge of the fascinating principles of chemistry The Outfit includes the contents of the No. 2L Outfit, with additional chemicals and apparatus, consisting of a large Wide-necked Flask with Thistle Funnel and Delivery Tubes, and a Blowpipe and a Charcoal Block. Price 25/–

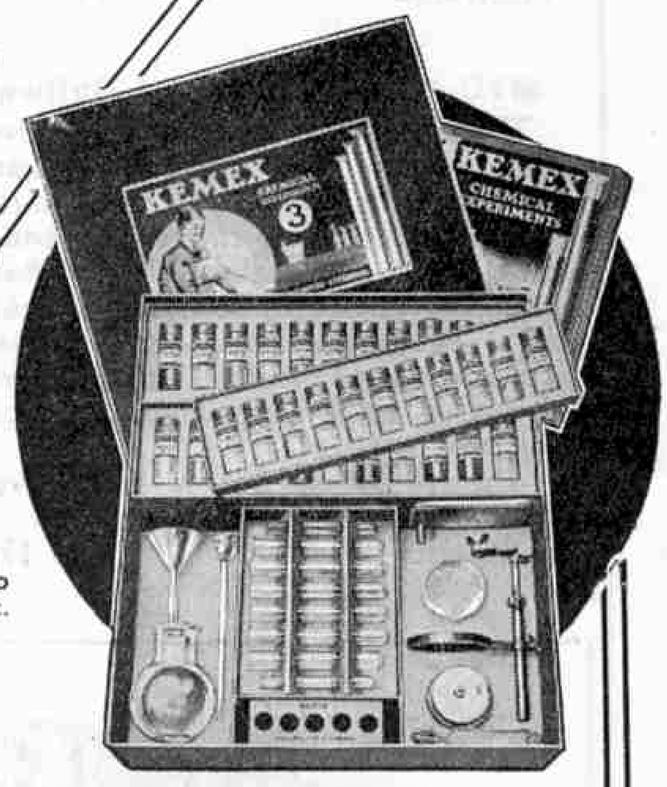
No. 3B Meccano Kemex Outfit

This is exactly the same as the No. 3L Meccano Kemex Outfit, except that a highly efficient Bunsen Burner, with the necessary length of rubber tubing is included in place of the Spirit Lamp. Price 25/–



No. 2 Meccano Kemex Outfit.





No. 3 Meccano Kemex Outfit.

Ask your dealer for the leaflet giving a list of Kemex parts and their prices, or write for a copy to the address given below.

The apparatus included in Kemex Outfits and refills of Kemex chemicals can be obtained separately

Manufactured by
MECCANO LTD.
Binns Road
LIVERPOOL 13

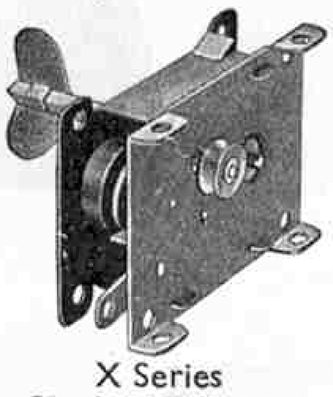


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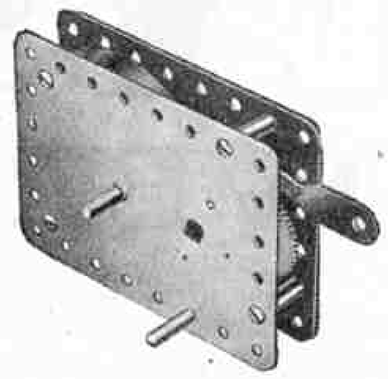
Run your Meccano models with a Meccano Power Unit

If you want to obtain the fullest enjoyment from the Meccano hobby you should operate your models by means of one of the Meccano power units described below. You push over the control lever of the Clockwork or Electric Motor, or the Steam Engine, and immediately your Crane, Motor Car, or Windmill commences to work in exactly the same manner as its prototype in real life.

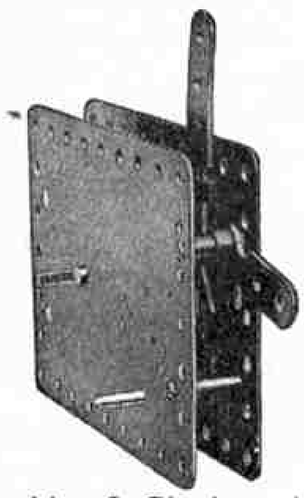
The side plates and bases of each Motor and the Steam Engine are pierced with the standard Meccano equidistant holes, which enables the unit to be built into any Meccano model in the exact position required.



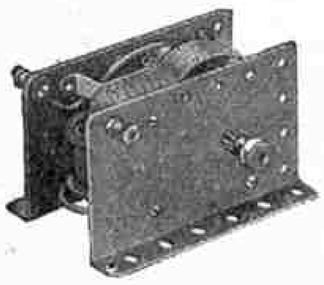
X Series Clockwork Motor



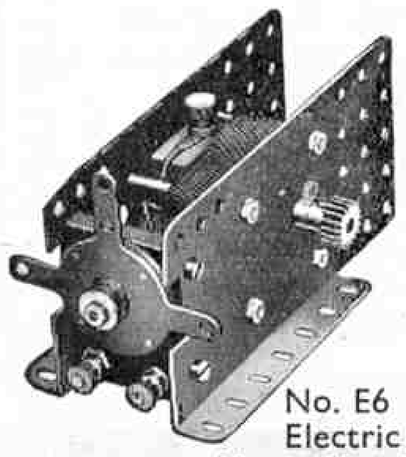
No. 1 Clockwork Motor



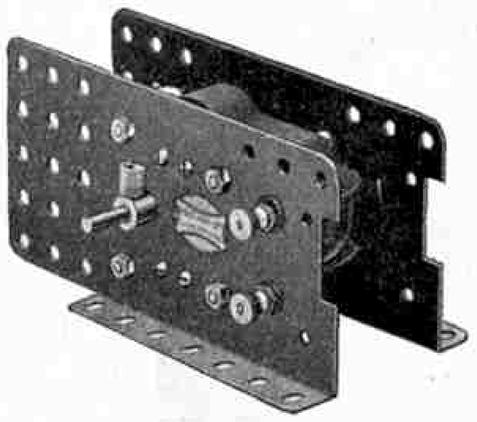
No. 2 Clockwork Motor



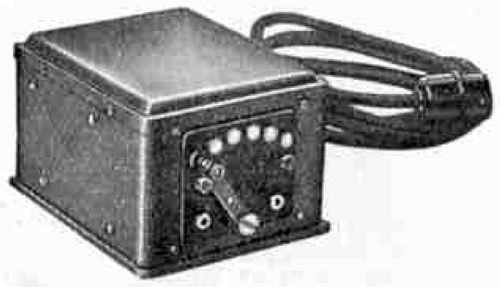
No. E1 Electric Motor (6-volt)



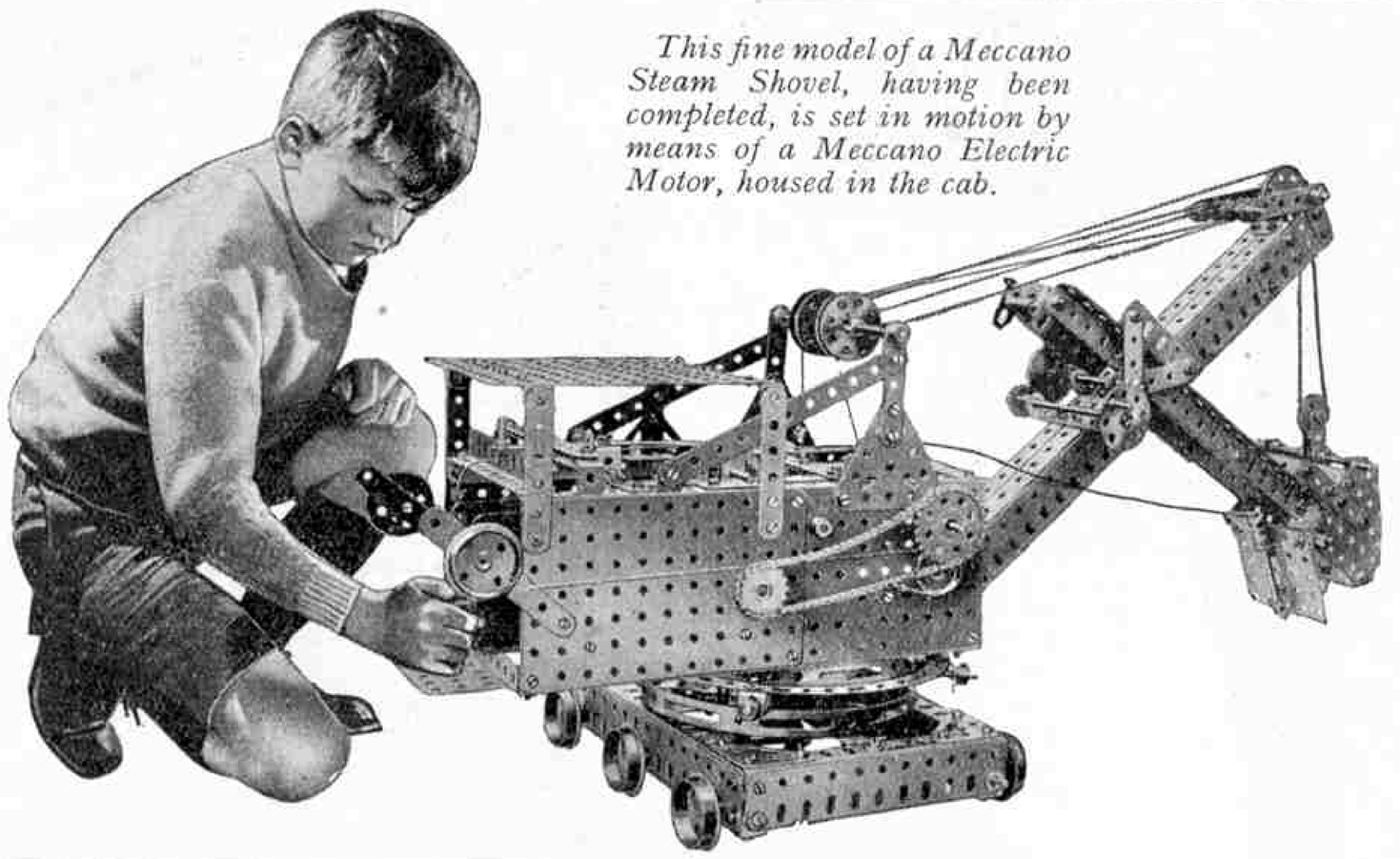
No. E6 Electric Motor (6-volt)



No. E20a Electric Motor (20-volt)



No. T20 Transformer



This fine model of a Meccano Steam Shovel, having been completed, is set in motion by means of a Meccano Electric Motor, housed in the cab.

DETAILS OF MECCANO POWER UNITS

MECCANO CLOCKWORK MOTORS

These are the finest Clockwork Motors obtainable for model driving. They have exceptional power and length of run.

X SERIES CLOCKWORK MOTOR. This Motor is specially designed to drive with ease any of the X Series models. It is non-reversing ... ... Price 2/6

No. 1 CLOCKWORK MOTOR. An efficient and long-running Motor fitted with a brake lever by means of which it can be started and stopped. It is non-reversing. Price 5/–

No. 1a CLOCKWORK MOTOR. This Motor is more powerful than the No. 1 Motor and is fitted with reversing motion ... ... Price 7/6

No. 2 CLOCKWORK MOTOR. This is a Motor of super quality. Brake and reverse levers enable it to be started, stopped or reversed, as required ... ... Price 10/–

MECCANO ELECTRIC MOTORS

The five Meccano Electric Motors listed below have been designed specially to provide smooth-running power units for the operation of Meccano models. The 6-volt Motors can be operated through a Meccano Transformer direct from the mains, providing that the supply is alternating current, or from a 6-volt Accumulator. They cannot be run satisfactorily from dry cells. The 20-volt Motors are most conveniently operated through a 20-volt Transformer from alternating current supply mains.

No. E1 ELECTRIC MOTOR (6-VOLT). Non-reversing ... ... Price 9/–

No. E6 ELECTRIC MOTOR (6-VOLT). Reversing ... ... ,, 15/6

No. E120 ELECTRIC MOTOR (20-VOLT). Non-reversing ... ... ,, 10/–

No. E20A ELECTRIC MOTOR (20-VOLT). Non-reversing ... ... ,, 16/6

No. E20B ELECTRIC MOTOR (20-VOLT). Reversing ... ... ,, 18/6

ACCUMULATORS

The Meccano 6-volt Accumulator is specially suitable for running 6-volt Electric Motors. The Meccano 2-volt Accumulator is supplied for converting 4-volt Accumulators to 6-volt.

MECCANO 6-VOLT ACCUMULATOR ... Price 27/9

MECCANO 2-VOLT ACCUMULATOR ... ,, 9/3

MECCANO TRANSFORMERS

Meccano Transformers provide a convenient and safe means of driving 6-volt or 20-volt Electric Motors and Train Sets from the mains supply where this is alternating current.

All Meccano Transformers are available for the following Alternating Current supplies: 100/110 volts, 50 cycles; 200/225 volts, 50 cycles; 225/250 volts, 50 cycles. They can be specially wound for other supplies.

In ordering a Transformer the voltage and frequency of the supply must be stated. These particulars are given on the supply meter.

No. T6A TRANSFORMER (Output 40 VA at 9/3½ volts) for 6-volt Electric Motors or 6-volt Trains. Fitted with speed regulator and separate circuit for supplying current for eighteen 3½-volt lamps ... ... Price 22/6

No. T6 TRANSFORMER (Output 25 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. Fitted with speed regulator ... ... Price 17/6

No. T6M TRANSFORMER (Output 25 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. This is similar to No. T6, but is not fitted with a speed regulator. Price 12/6

No. T20A TRANSFORMER (Output 35 VA at 20/3½ volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with speed regulator and output sockets for lighting lamps. Price 22/6

No. T20 TRANSFORMER (Output 20 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with 5-stud speed regulator... ... ... Price 17/6

No. T20M TRANSFORMER (Output 20 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. This is similar to No. T20, but is not fitted with a speed regulator. Price 12/6

RESISTANCE CONTROLLERS (6-volt or 20-volt)

By use of these Controllers the speed of Meccano Electric Motors and Hornby Electric Trains can be regulated as desired ... ... Price (6-volt or 20-volt) 3/9

MECCANO STEAM ENGINE

This is a safe and powerful steam unit. On actual test it has lifted over 56 lbs. Operation of the reversing lever enables the crankshaft to run in either direction ... Price 25/–

MECCANO LIMITED BINNS ROAD LIVERPOOL 13

SIZES AND PRICES*	
20 inch chest	8/6
22 „ „	9/6
24 „ „	10/6
26 „ „	11/6
28 „ „	12/6
30 „ „	13/6
32 „ „	14/6
34 „ „	15/6

*Post free U.K. only. Add 1/- for Overseas.



APPROVED DESIGNS

MECCANO JERSEYS AND PULLOVERS

You have probably noticed that all the Meccano boys illustrated in the Meccano advertisements and catalogues wear a regulation Meccano Jersey, with dice on the collar, cuffs and waist.

These Meccano Jerseys are now available in a variety of colours, particulars of which are given below. Behind these Meccano Jerseys, the design of which has been approved by Meccano Ltd., is over 30 years' experience of textile manufacture. They are made in a British Factory by British workpeople, from Patons and Baldwins' wool. The colours are fast to light and washing.

The Jersey is also made as a Pullover with a V neck. The sizes, prices and colours are the same as for the regulation garment.

Every Jersey has a special Meccano tab inside the neck. When you see this tab in your jersey you know that it is the genuine article. Each garment is despatched carefully packed in a cardboard box.

For sizes and prices refer to panel in top left corner.

Cash with order.

COLOURS FOR JERSEYS AND PULLOVERS	
Body Colour	Dice
No. 1 Blue	Orange and Green
No. 2 Scarlet	Blue and Orange
No. 3 Orange	Green and Scarlet
No. 4 Green	Orange and White
No. 5 Grey Mixture	Blue and Orange
No. 6 Heather „	Scarlet and White
No. 7 Fawn „	Orange and White
No. 8 Lovat „	Green and White

Ties to match all colours: 9d. each.

Direct Trading Organisation, 9, Union Court, Liverpool 2

BEST WISHES FOR 1935 TO ALL MY READERS — FROM THE EDITOR

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XX. No. 1
January, 1935

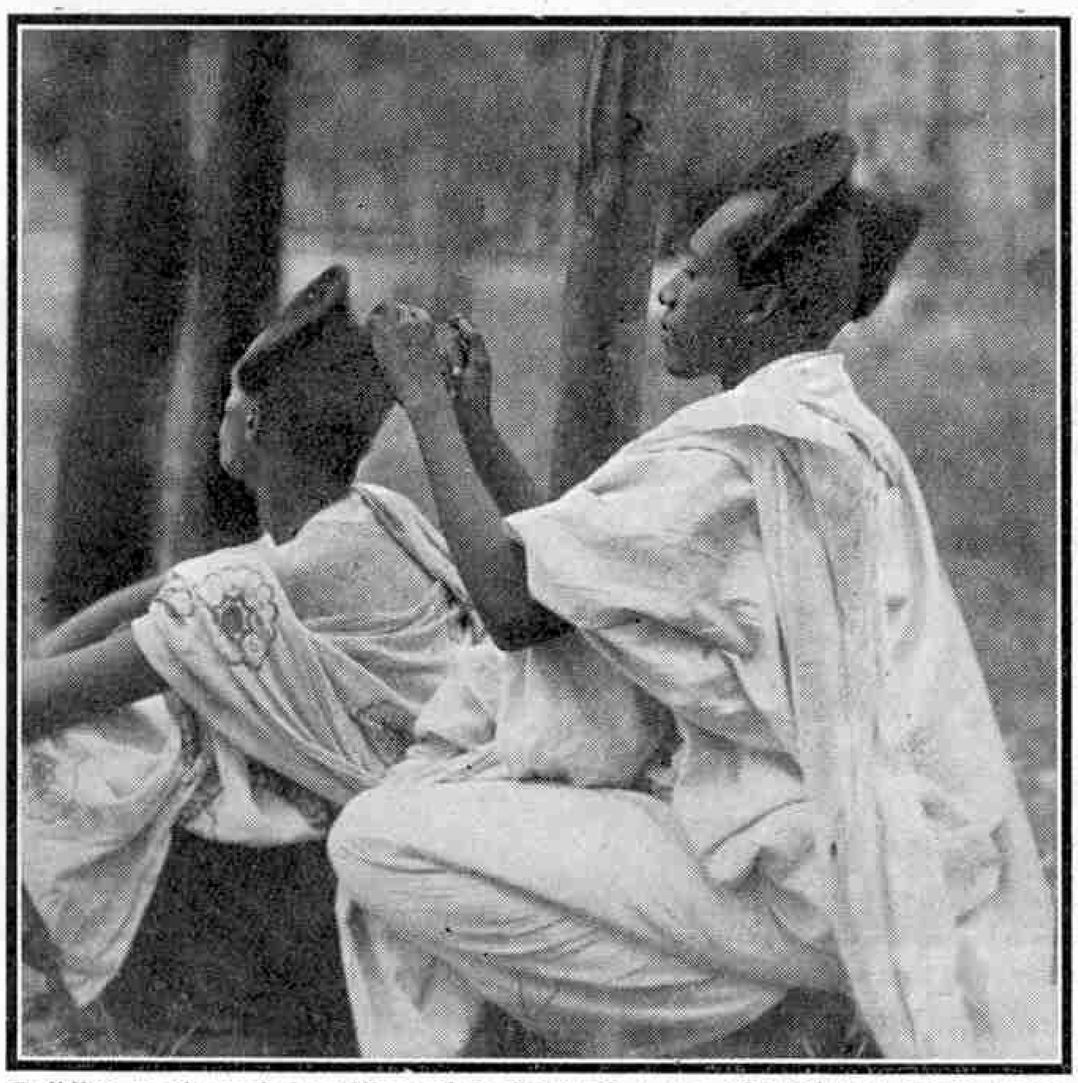
With the Editor

British Engineering Feats in 1934

At this time of the year it is always interesting to look back over the chief engineering events of the past twelve months. It seems to me that the outstanding feature of the year is the manner in which British engineers have upheld their pre-eminent position in large scale engineering work in remote parts of the world. The British engineer has always been a pioneer, and has gained a wonderful reputation for his unique combination of skill in design, soundness in construction and ability in overcoming difficulties.

These characteristics were shown in 1934 in the completion of the giant railway bridge across the lower Zambesi River, which I hope to describe in an early issue of the "*M.M.*" At the point where the bridge stands the river has a width in the rainy season of nearly two miles, and it was necessary to build an immense structure with 33 main spans and six approach spans, and an overall length of 11,653 ft. 9 in., to carry the railway across it. The new structure is the longest railway bridge in the world that is continuously over water.

Another branch of engineering in which Britain holds a foremost place is the construction of dams and other work necessary for huge irrigation schemes. By this means British engineers have transformed Egyptian and Indian deserts into prosperous agricultural areas. Last year witnessed the official inauguration of the Metur Cauvery Dam, a great barrier over a mile in length and 176 ft. in height, behind which the flood waters of the Cauvery River can be stored for distribution as required over an area of 301,000 acres. The scheme is by no means the largest that has been carried out in India by British engineers, but its completion continues the story of the wonderful efforts to improve the lot of the inhabitants of India.



Building up the artistic coiffure of the Watussi, a race of handsome giants, many of them 7 ft. 6 in. in height, who live in Ruanda, in the Belgian Congo. This photograph was taken on Commander Attilio Gatti's eighth expedition to Central Africa, and a series of articles by this famous explorer will commence next month.

The World's Greatest Lift Bridge

At home the skill of British engineers has been demonstrated by the completion at Middlesbrough of the gigantic lift bridge opened in February last by the Duke of York. This is the first of its type to be built in this country, and the largest in the world. Its lift span actually weighs 2,700 tons, and as this is balanced by means of huge counterweights, the supporting towers have to sustain a total load of no less than 5,400 tons. An illustrated article on this bridge will appear shortly.

The completion of the great Mersey Tunnel was another outstanding engineering feat of 1934. This tunnel, which was fully described in the September issue of the "*M.M.*," is nearly two miles in length, and its great bore, 50 ft. in diameter, makes it the largest under-water tunnel in the world.

Shipbuilding and Aviation

No survey of last year's activity would be complete without a reference to the launch of the Cunard White Star liner "*Queen Mary.*" The immense size of this vessel and the expectation that her speed will enable her to recover the Blue Riband of the Atlantic for Great Britain aroused intense excitement, and the appearance on the seas of the mammoth liner will be awaited with keen anticipation. Everybody will be particularly interested to see how she compares with the "*Normandie,*" her great French rival, which is expected to enter the trans-Atlantic service in May or June of this year.

In aviation the outstanding event of 1934 was the success of the De Havilland "Comet" in the MacRobertson Air Race. When the conditions of the race were announced, there was no British aeroplane with sufficient speed and capacity for long flights to promise success against machines built in other countries. Only eight months remained in which to design and produce a machine of this description, but that sufficed for the completion of the "Comet." The engines as well as the machine itself were new, and they were designed and built with such remarkable skill that Scott and Black were able to complete their amazing flight practically without mechanical trouble, although no time was available for test flights and prolonged tuning. Never before in the world's history has a journey of 11,000 miles been made in less than three days. Other competitors also broke existing records during the race, and it is noteworthy that in a Miles "Hawk" Sqdn. Ldr. McGregor and H. C. Walker of New Zealand set up a light aeroplane record by reaching Australia in 5 days 14 hrs.

The great flight proved the worth of British airmen as well as the skill and judgment of our aeroplane designers and manufacturers.

Famous Explorer Writes for the "M.M."

Next month I hope to publish the first of a series of articles of outstanding interest contributed by Commander Attilio Gatti, the famous explorer, who has repeatedly penetrated previously unknown lands in the Belgian Congo and other parts of Central Africa that are inhabited by pigmies and frequented by gorillas. Commander Gatti is well known to my readers, for I have already published several stories of African adventure by him. He is now engaged in his eighth expedition, undertaken largely for the purpose of discovering rare creatures of which he has heard rumours among his native friends. The articles and photographs will be sent by air mail, so that they will come direct from the equatorial forests of Central Africa to "*M.M.*" readers.

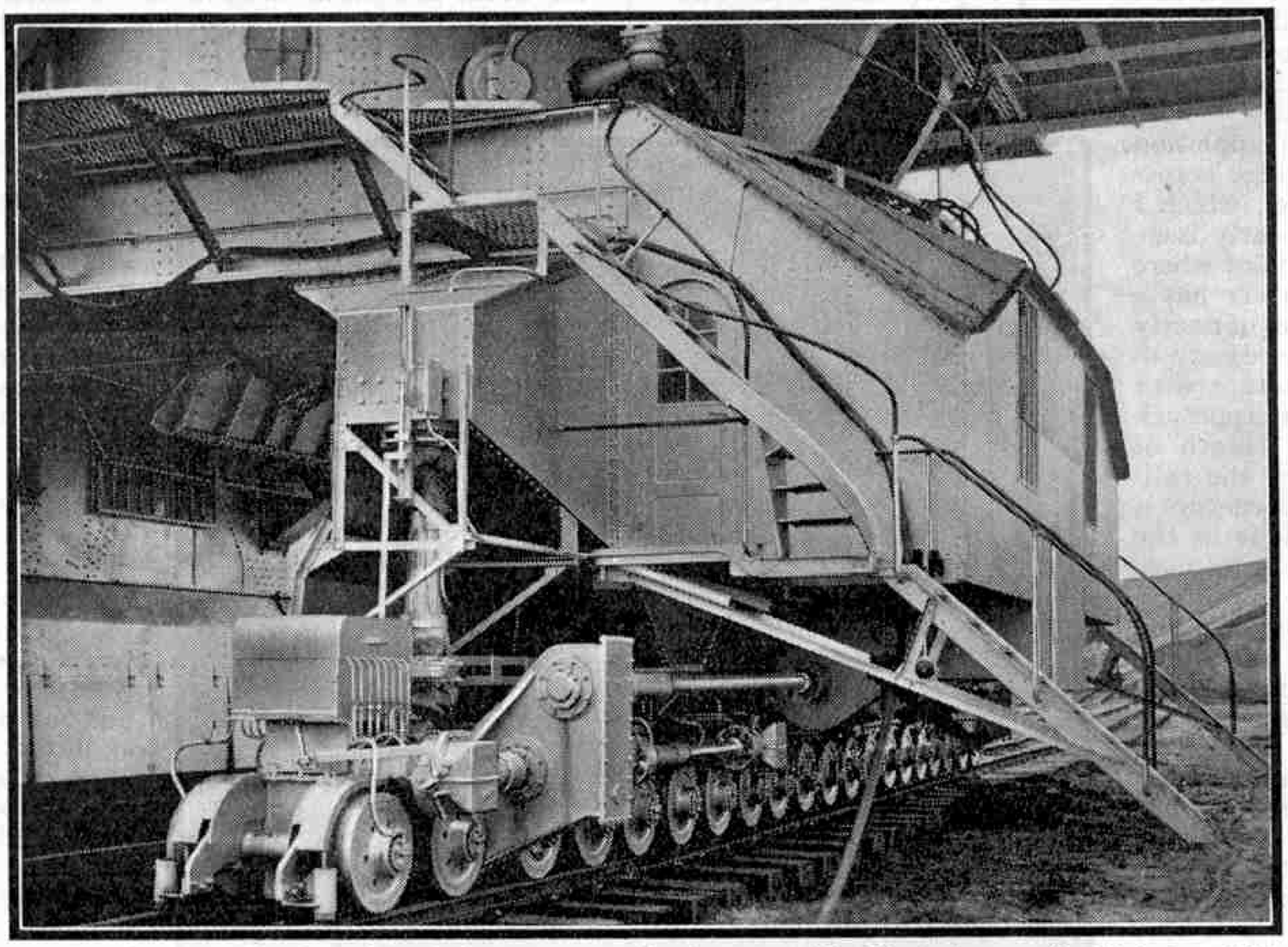
Dredging Fuel from the Earth

Machines win 150 Million Tons of Coal a Year

By H. F. Kutschbach

OUR cover this month shows part of a giant bucket dredger-excavator that is employed on the brown coalfields of the Rhineland district of Germany, and the upper illustration on the opposite page shows the entire machine. It consists of an enormous superstructure built like the jib of a crane, and mounted on a base resembling that of a portal crane. The boom carrying the dredger buckets has a total length of 167 ft. and a working length of a little more than 115 ft., and is made in sections hinged together so that it can be employed in different positions. One end of the boom is attached to the superstructure, and wire ropes suspended from the jib support each section. Thus the working sections can be lowered to enable excavation to be carried out on a slope below the machine, and when they are raised the buckets can be made to dig along an upward slope.

The superstructure of the machine also can be turned round on its base, so that it is capable of working at any angle to the tracks on which it travels; and double railway tracks below enable wagons to be brought underneath to receive the material dug out by the buckets. The entire machine weighs 800 tons, and this enormous burden is distributed over 80 wheels.



One side of the travelling base of the dredger-excavator, showing some of the 80 wheels supporting its huge weight.

The purpose for which this machine has been designed is that of winning the brown coal that is so abundant in many parts of Germany. Mention of coal mines usually suggests shafts sunk far down into the earth, and galleries driven from various levels in the shafts into the deeply-buried seams of coal. The brown coal of Germany is not all at great depths, however. In some parts of the Rhineland there are seams, more than 330 ft. in thickness, that are covered only by shallow layers of sand, clay or loam, to which the name of "overburden" is given. No shafts are sunk, therefore, but instead the overburden is removed by enormous excavators of various types. These are employed also to dig out the coal itself, which contains more volatile matter than the bituminous coal and anthracite with which we are familiar in this country, and is comparatively soft and easily excavated. This plan is followed even where the overburden is as much as 200 ft. in depth, as it is in certain German brown coalfields.

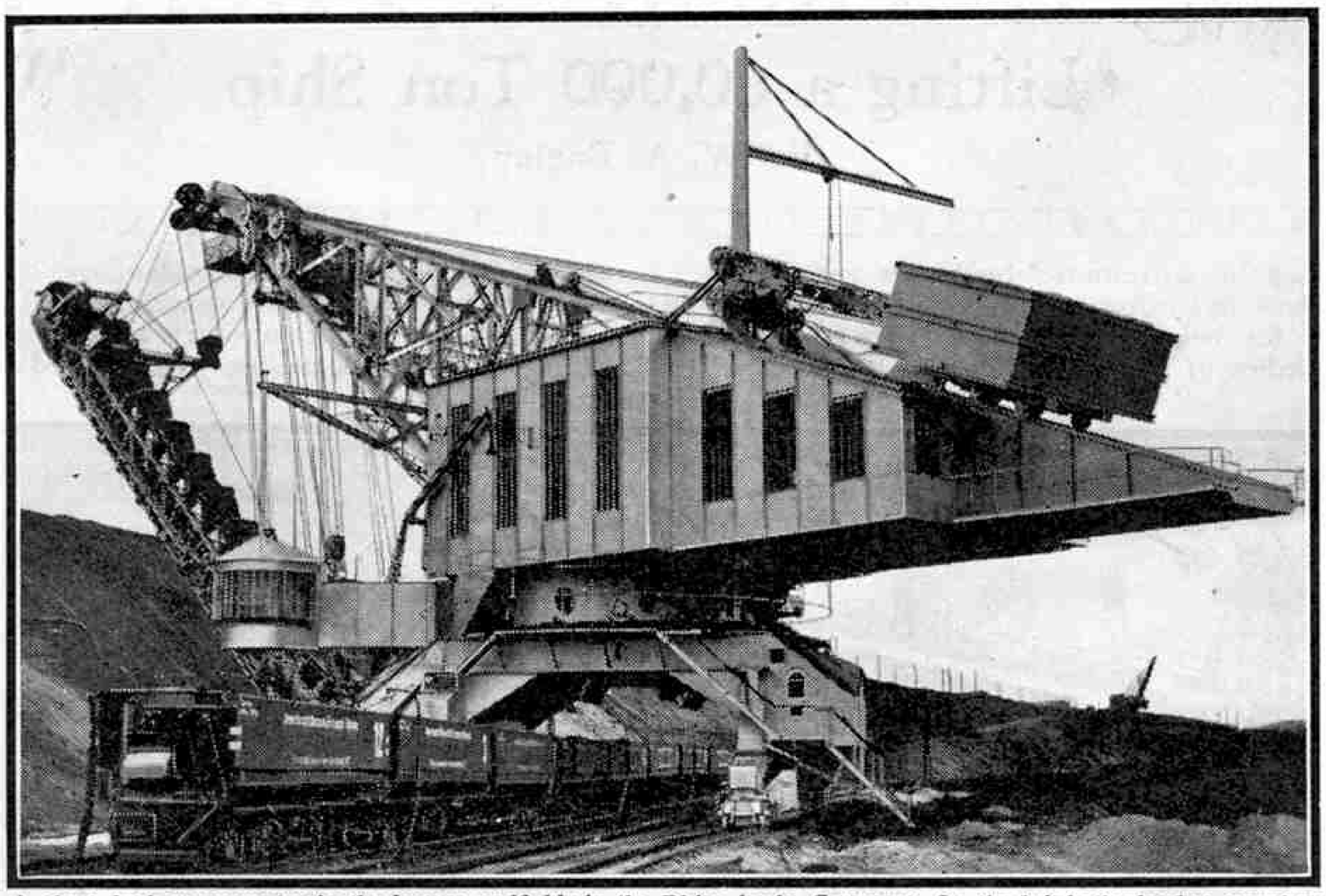
Coal winning of this kind is described as open-cut mining, and has proved more economical in use than the ordinary mining methods employed for the extraction of brown coal up to about 35 years ago. Similar methods are being followed in other parts of the world, notably in Illinois in the United States of America, and in Victoria, Australia. In America giant electrical shovels usually are employed for this purpose, and an enormous shovel with a bucket holding 20 tons, and capable of accommodating a saloon car, was described on page 930 of the *"M.M."* for December, 1930.

German practice favours the use of dredger-excavators instead of mechanical shovels for digging out both the coal and the overburden, and the machine illustrated in this article was constructed for this purpose by Maschinenfabrik Buckau R. Wolf A.G., Magdeburg. It is electrically operated, and is one of the largest of its kind in the world. Many other enormous machines of similar type are now in use. Most of these run on rails, but some are fitted with creeper tracks, and they give an annual output of more than 150 million tons of brown coal. It has been calculated that the total bulk of coal and overburden handled by these machines in a year is more than twice that dredged during the construction of the Panama Canal.

The boom of this dredger-excavator has 41 buckets, each with a capacity of nearly $1\frac{1}{2}$ cu. yds., and is made in four sections. The fixed portion attached to the superstructure is shown in detail on the cover. It is a short carrying section, along which the buckets run from the working face to the chutes through which the excavated material is delivered; and it is cased in to prevent the spilling of coal or earth near the tracks on which the machine runs. The angle it makes with the superstructure can be adjusted to bring its lower end into a suitable position for the working face that is being excavated. Hinged to the outer end of this section is a second, which

also is short; and this is followed by a long third member and the outermost section, these three constituting the part of the boom where the buckets dig as they move.

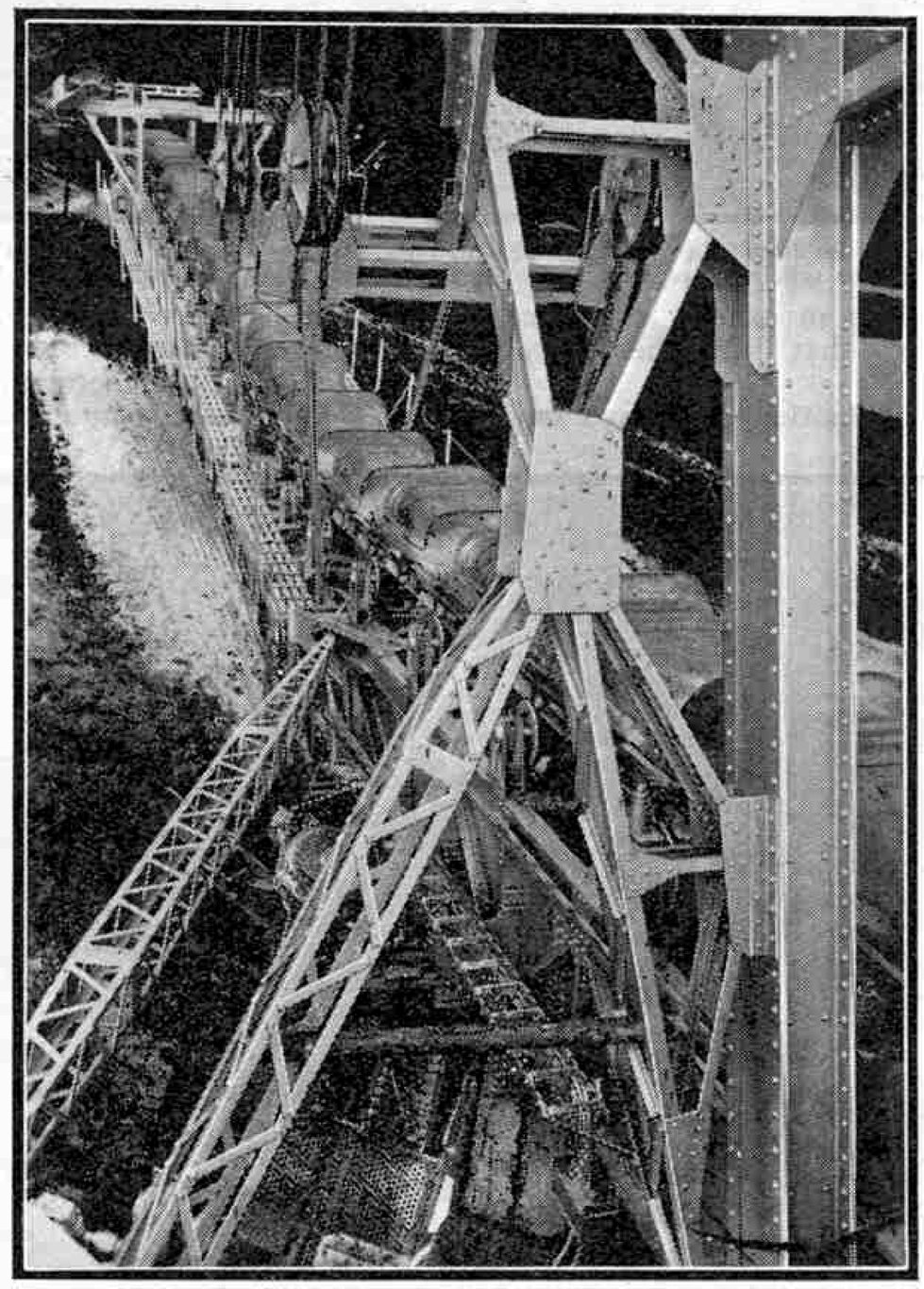
As the sections of the boom are hinged together and suspended separately, they form a flexible unit that can be set in a straight line, or given a variety of arrangements in which certain sections, or all, are inclined at various angles up to 40 deg. above or below the horizontal. This enables them to excavate from banks rising to a height of 66 ft. above rail level, or descending to depths of 72 ft. below it. In some positions the boom is extended farther than in others, and during its movements the machine is automatically balanced by means of a heavy counterpoise mounted on rails on the top of the superstructure, the movements of which are controlled by wire ropes connected to the winches that raise and lower the sections of the boom.



A giant dredger-excavator in the brown coalfields in the Rhine basin, Germany. On the left is the bucket-carrying boom suspended from the jib of the superstructure.

When at work the buckets travel in close order backward and forward along the face, bringing back the excavated material and tipping it through a chute into the wagons brought underneath the travelling carriage to receive it. They are attached to an endless chain, 351 ft. in length, that pulls them round at a speed enabling 21 buckets to be discharged in a minute. Naturally the capacity of the machine varies with the hardness of the material it is digging out, but when working at its usual speed it takes up from 1,300 cu. yds. to 1,500 cu. yds. an hour.

The swivelling superstructure or turret is carried on eight rollers on a circular track on the travelling base, and these are so constructed that the load is automatically adjusted and distributed over three points. The tracks on which the base runs are double on each side, and the distance between their centres is a little more than 28 ft. This allows the provision of a portal wide enough to accommodate two railway tracks for the wagons into which the material is discharged, and the opening beneath the machine gives ample clearance, being more than 14 ft. in height.



The boom of the machine. The empty buckets can be seen travelling outward, and above are the wire ropes from which the boom is suspended.

The 80 wheels supporting the giant structure are divided into groups of eight, each group being mounted in a bogie. Only half of them are driven; the remainder are trailing wheels, and some of those on one side of the machine, together with the driving wheels on the same side, have double flanges. These double flanges are employed on what is known as the low-digging side, and the superstructure is rotated so as to bring the boom to this side when excavation is being carried out on a face below the machine. Excavation on an upward slope, as shown in our illustrations, is carried out with the boom swung round to the opposite or high-digging side of the travelling carriage, and in each case the double flanges are in the best position to give the resistance required to counteract the enormous side thrusts developed when the machine is at work.

One difficulty in designing dredger-excavators of this kind is to ensure uniform loading of the rails in all positions of the superstructure and of the boom. In this machine certain bogies are mechanically coupled together in two groups to take up part of the load, and a hydraulic system is used to distribute the rest of it equally over the 48 wheels in six of the 10 remaining bogies. These 48 wheels take up their load indirectly through hydraulic cylinders on the bogies carrying them, and the cylinders are interconnected by means of pipes.

The travelling base is driven by four 30 h.p. motors carried in houses, each containing two motors, on each side of the base. The rest of the motors operating the machine are housed in the superstructure, which also carries the two operating cabins. These cabins project from the working side of the machine and are connected by means of a gallery. They are round, and are provided with ample windows to enable the man in charge of the machine to watch the work of the buckets, and also to follow the loading of the wagons (Continued on page 42)

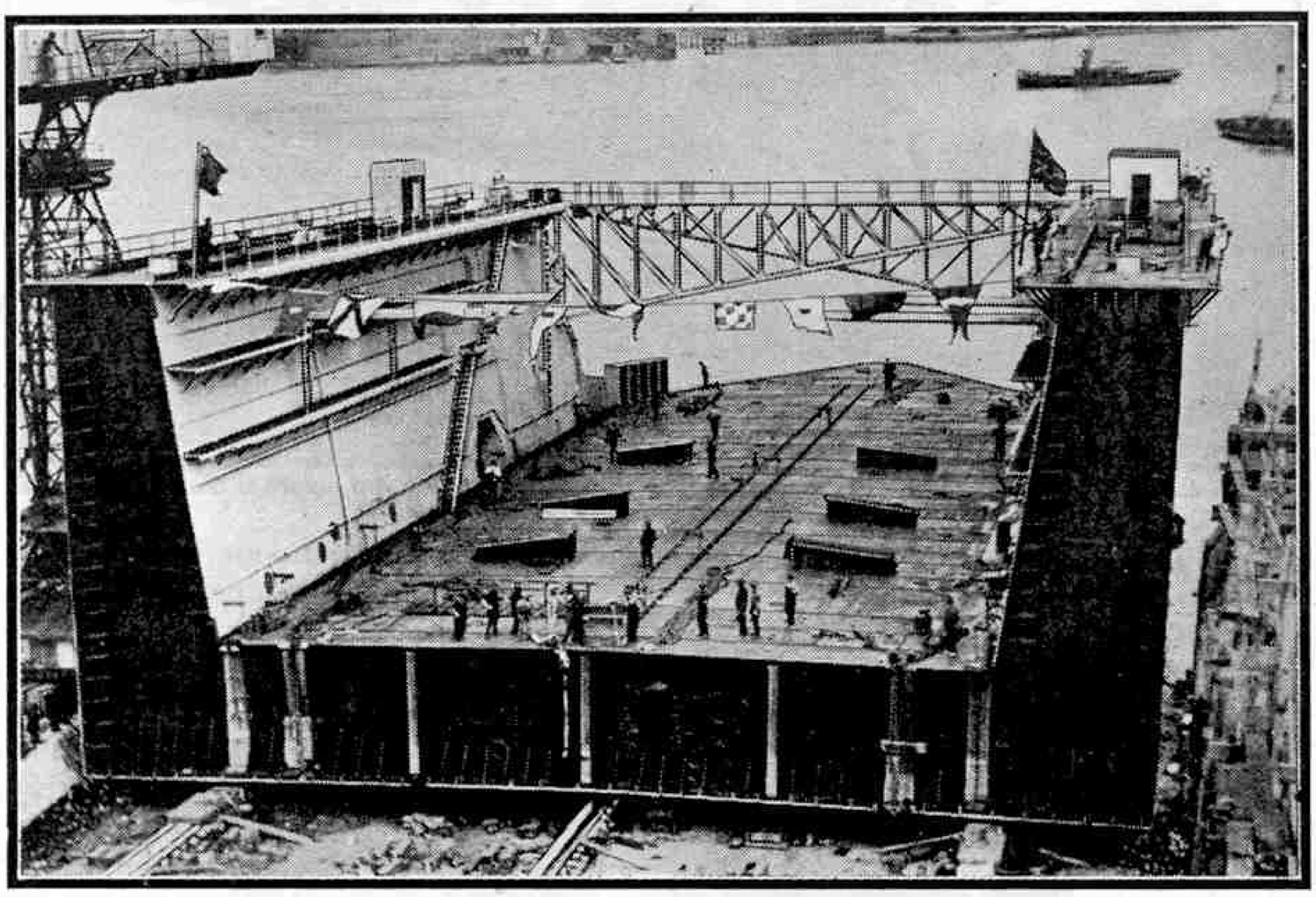
Floating Docks and Their Work

Lifting a 60,000 Ton Ship

By W. A. Bagley

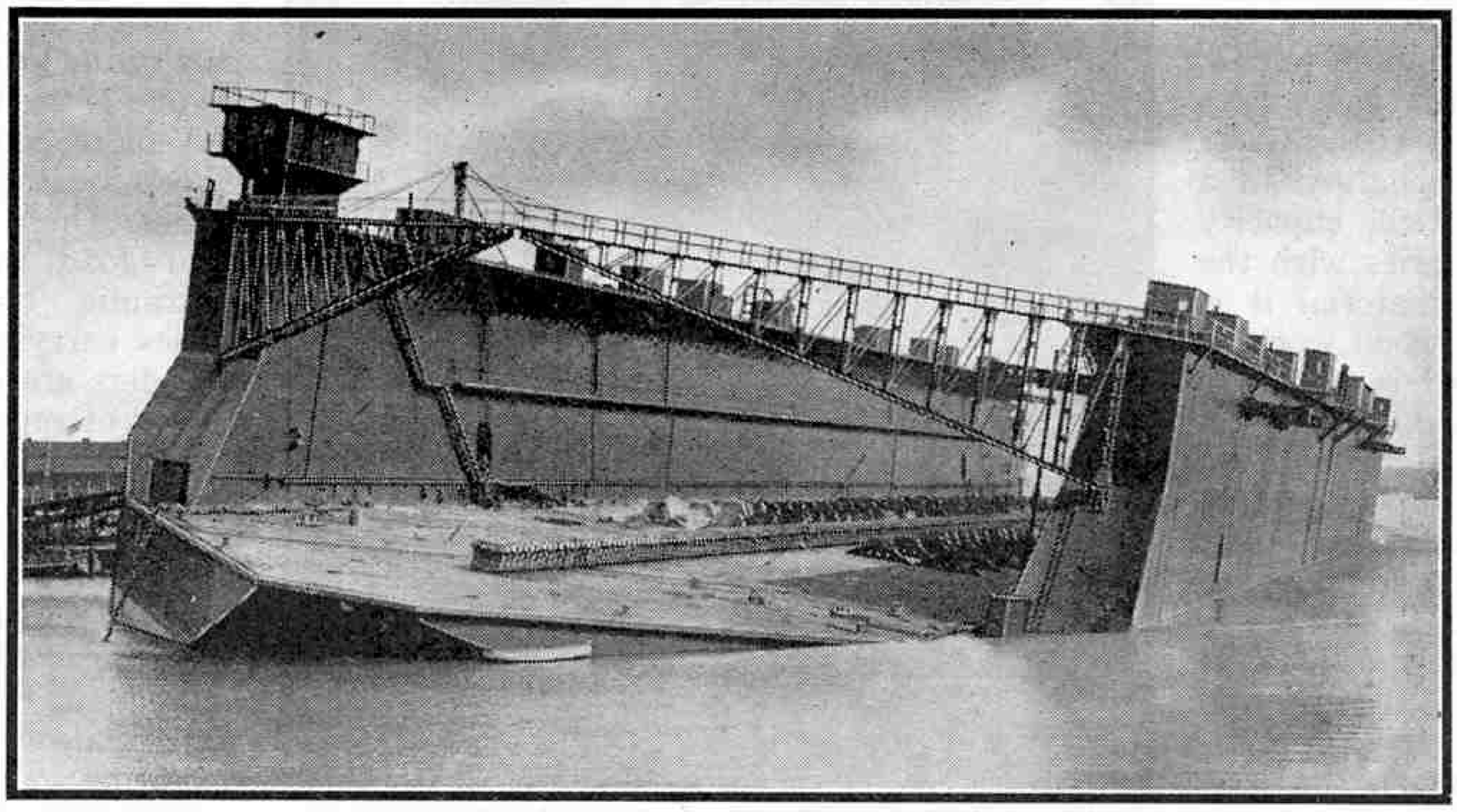
HIGH up in his steel cabin, surrounded by levers very much after the fashion of those in a railway signal cabin, an engineer depresses a switch, and far below him pumps begin to work, motors hum, and the needles of gauges flicker. An hour or two later a huge ship, thousands of tons of steel, is lifted clear above the sea level, and for the next two or three days and nights a gang of workmen will scrape away the evidences of the ship's voyages, and repaint her rusty plates. Then she will be lowered into the water again to sail away on fresh enterprises.

The modern wonder that enables this to be done is known as a floating dock. Like most other engineering triumphs it has been evolved gradually from primitive makeshifts until to-day it has reached a very high standard of reliability and efficiency. The underlying principle is simple. The floating dock raises a ship in exactly the same manner as water wings raise a swimmer—that is by the natural buoyancy of air.



Launching the Bow End Section of the Walsh Island (Australia) Floating Dock, of 15,000 tons' lifting power. The illustrations to this article are reproduced by courtesy of Messrs. Clark and Standfield, Westminster.

Before we discuss the various types of floating docks and how they work, a brief explanation is necessary in order to distinguish between dry docks, wet docks, etc., as the word "dock" is used somewhat loosely. A "wet dock" is simply an enclosed water space, where vessels can load and unload to the best advantage. A "dry dock," on the other hand, is for overhauling and repairing vessels, and is often referred to as a graving dock. A dock of this type consists of an excavated basin fitted with a watertight gate, so that after the ship has been docked the water can be pumped out and the ship left high and dry. The graving dock is the present-day development of the old-time custom of laying a vessel up a tidal creek at spring tides and then hastily constructing a dam to prevent the water from re-entering. This time-honoured custom is not yet dead. Quite recently a paddle steamer was stranded on Sidmouth beach, and it was found that the accident was really a blessing in disguise. The site was as good as a dry dock, and the vessel was allowed to remain there until temporary repairs had been carried out.



A Floating Dock being heeled over to inspect the underwater parts.

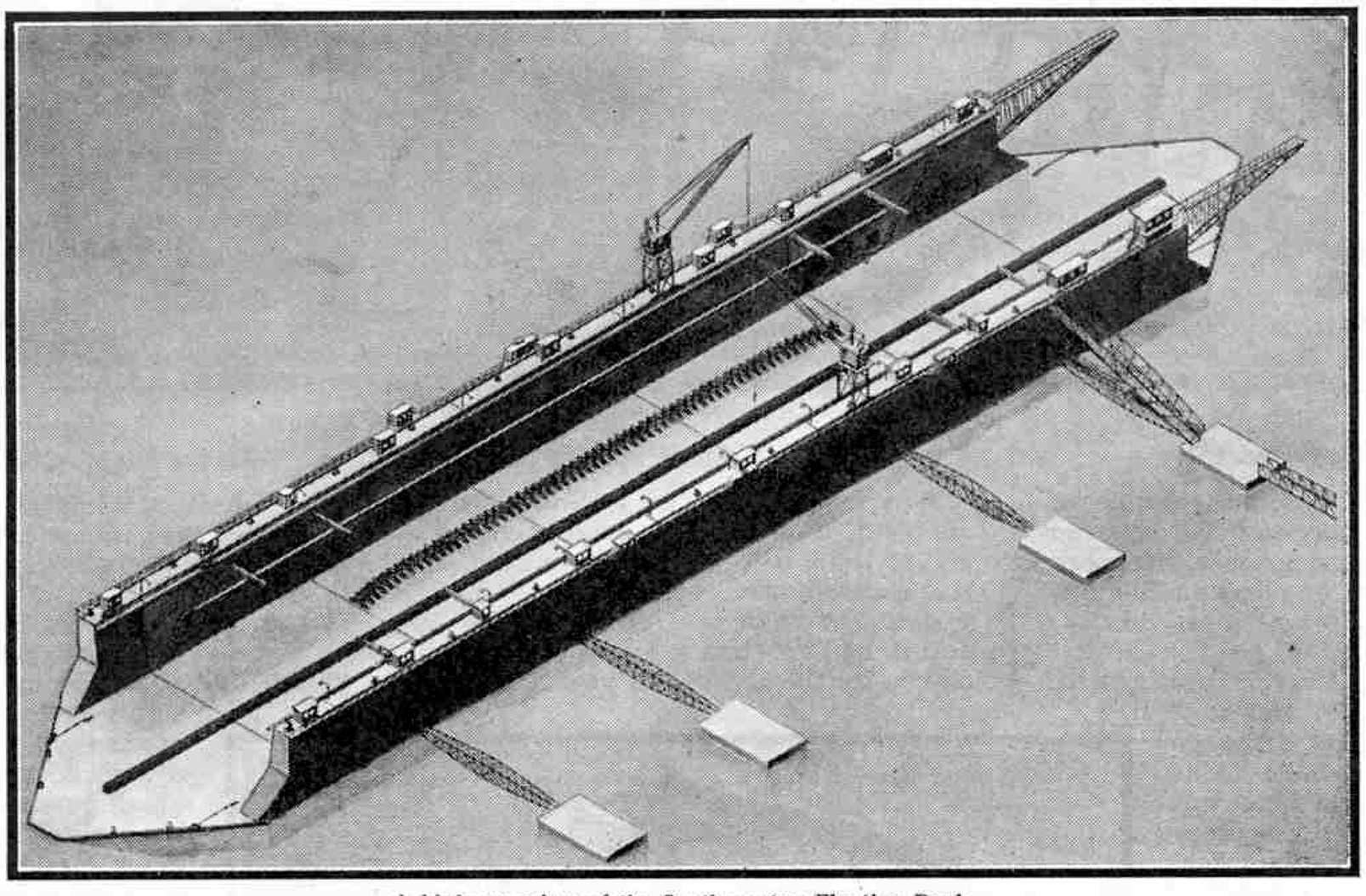
The floating dock can best be described as a large rectangular steel trough, in section shaped like a "U" with square corners. This "U" is made up of a great hollow steel box or pontoon, on the long edges of which are erected two hollow walls, leaving the structure open at both ends. It is upon the pontoon that the ship eventually will rest. Along its "backbone," so to speak, are big blocks of timber called "keel blocks," about a yard in height, and erected directly over strong girders running transversely across the interior of the dock. If we could remove the steel plates that form the "skin" of the dock and look upon its framework, we should see in the pontoon strong girders running both longitudinally and transversely, while in the side walls we should see frames erected about every 2½ ft. apart. There are no curved parts such as are found in general shipbuilding work and, with an automatic punching machine to make the holes for the rivets, construction is generally a straightforward and simple matter. Indeed, it is the boast of the advocates of floating docks that these can be built in a very short space of time—six months or so—as compared with the two, three, or even more years necessary to excavate a graving dock.

When the ship has settled on the keel blocks, great wedges of timber called "bilge blocks," mounted on sliding carriages, are hauled up under the sides of the ship. From the side walls props of timber, or sometimes of latticed steel, are projected by means of a rack and pinion, so that the ship is held firmly in position. On the biggest docks these side-shores are geared together across the dock, so that they operate together, and the ship is automatically centred.

Other features of the floating dock that may be mentioned now are the roller fenders, rope-covered rollers of timber that protect the

front entrance of the dock against damage from collision with the ship it is required to lift; draughtboards; and flying gangways, two swinging gangways mounted on each side of the ends of the dock which, when closed, afford access from the top deck of one wall to that of another. Then there are cranes running on rails on the top decks of the side walls; the various cabins and houses for stores, crew accommodation, etc.; and the usual fittings to be met with on the decks of ships, such as bollards, fairleads, capstans, winches and ladders.

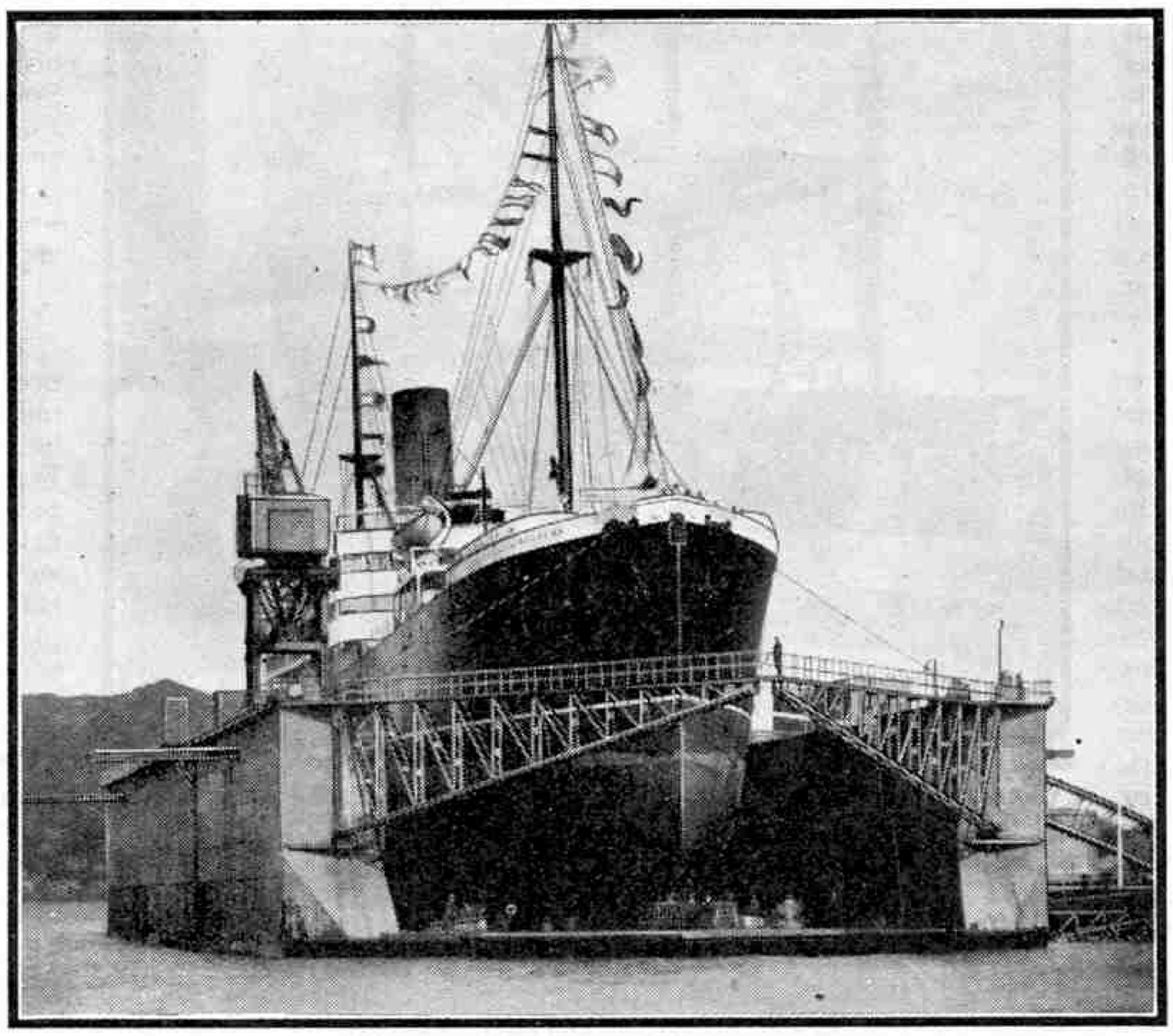
We now come to the actual docking and raising of the ship. Up in the side walls there is a deck on which are mounted motors that may be electric, steam, Diesel, etc. These motors, by means of a vertical shaft, drive centrifugal pumps situated low down in the pontoon. The pumps are seated on an iron pipe of large diameter that runs the length of the dock, and from this main pipe run branches to the various compartments into which the pontoon is extensively divided. All these branches are controlled by valves operated from the valve house.



A birds-eye view of the Southampton Floating Dock.

When it is required to lift a ship, valves are opened either by means of the levers mentioned at the beginning of this article, or by compressed air. Water is thus admitted, and the dock sinks until only the tops of the side walls remain above water. It will be realised that the tops of the keel blocks on the dock are below the level of the keel of the vessel to be raised. The ship is now allowed to enter, and when it is nicely centred the pumps are set to work. For every ton of water ejected, an upward lifting power of one ton is exerted by the dock, and so it slowly rises out of the water, carrying with it the ship. The residue of water still remaining in the pontoons beyond the scope of the pumps is drained off in troughs fitted to the underside of the dock.

This, in general terms, is how the dock works; but it will be apparent that the dock itself, being of steel, will eventually need overhauling. In small docks, and especially those required for use in a harbour where the water is not too corrosive, a dock known as the "box" dock is used. This is similar to the dock just described, the pontoon part and the walls all being in one piece. If it is desired to attend to the under-water parts of these, it is not difficult to let more water into one side than into the other, so that the dock tilts over, exposing the whole of one side wall and part of the bottom of one side of the dock. After the paint is dry the dock can be heeled or tilted over the other way. Box docks of great size have been built, and among them may be mentioned the British Admiralty floating dock stationed in the Medway, which has a lifting power of 33,000 tons.



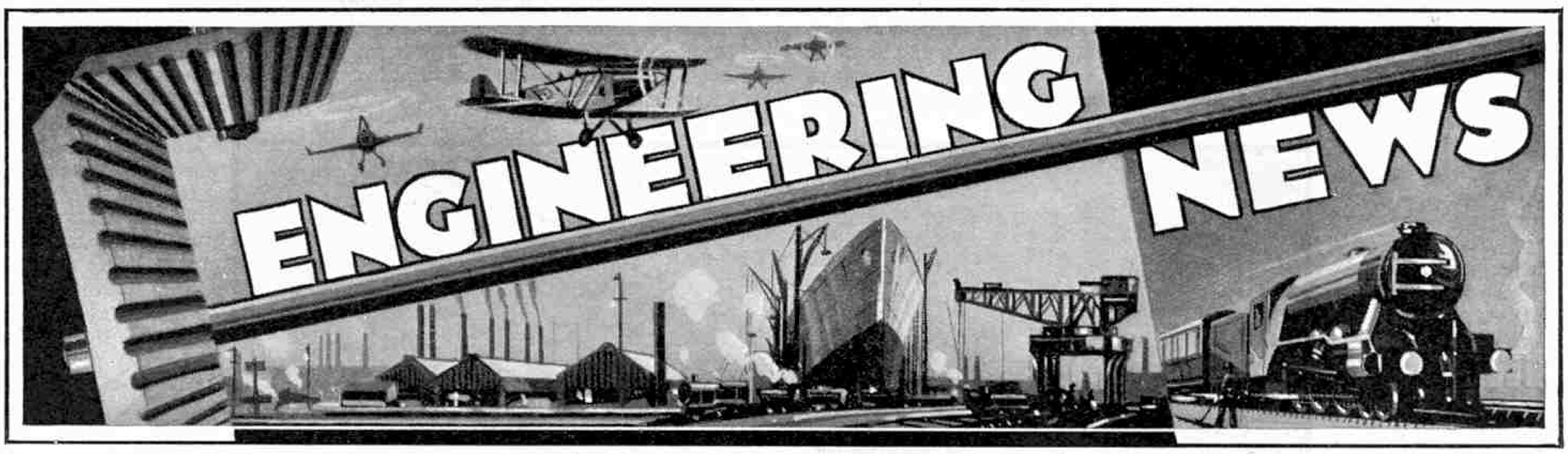
The Wellington Dock lifting R.M.S. "Ruahine," weight 11,200 tons.

Large numbers of docks are made "self-docking." Of all the types that have been tried out only three commend themselves to notice. The first is the "sectional pontoon," known as the "Rennie," after the name of its inventor. This has its pontoons, numbering about half-a-dozen, separate and detachable from the side wall, which is a continuous structure. It is fairly easy to unbolt one section, let it float away from the main structure, and then dock it in the rest of the dock, which will work quite well with one pontoon short. This type of dock is very suitable for ships of moderate dimensions, and in addition to being more convenient for towing about if necessary, it has the additional advantage of being easily constructed in places where docks of other types could not be completed. The separate pontoons, not being very large, can easily be erected and launched, after which the side walls can be built upon them.

The second type of self-docking floating dock is a very strong one, known as the "sectional box." Here the whole dock is cut into sections, say three, which are bolted together with a strong joint all round the edge, forming detachable units that can be unbolted when necessary and floated on to the others for docking. This method of self-docking is not quite so simple or so easy as the first, but it is not one that has to be undertaken very often.

The third type that deserves mention is the "off shore" type, which has only one wall, being shaped in fact like a letter "L." This is a most useful type when the site permits of its use, and the bank of a river estuary is ideal. Its stability is arranged for by securing it by means of booms to posts on the shore. These booms work exactly like the links on a parallel ruler. For self-docking purposes the dock is made in two parts, so that one part can be docked in the "lap" of the other, which is a simple operation.

The first definite use of a floating dock is believed to be that evolved by an English captain in Kronstadt Harbour in the Baltic during the reign of Peter the Great. Finding that the copper of his ship needed repairs, the captain bought an old hulk called the "Camel," gutted it and fitted it with a watertight gate at the stern. It was sunk and then pumped out after the manner of a modern floating dock. Quite a number of wooden docks of this type were made, and were known as "camel docks" after their prototype. Their long lease of life is surprising, but their great drawback lay in the fact that the natural buoyancy of the timber hampered their sinking. This drawback automatically (*Continued on page 67*)



A Giant British Excavator

A giant British excavator capable of dealing with enough clay to make between five and six million bricks in a week has recently been built by Ruston-Bucyrus Ltd., of Lincoln, for use at a large brick-works. It is claimed to be the largest that has ever been built in this country with a caterpillar mounting, and it is interesting to note that although the caterpillar track belts alone weigh 25 tons, the machine was completely erected in the makers' factory and travelled to the brick-works under its own power.

The excavator has a boom 85 ft. long, and this enables it to dig to a depth of 55 ft. The bucket has a capacity of 5 cu. yds., which means that one bucketful of clay is enough to make about 1,500 bricks. The caterpillar tracks are 126 ft. long, 5 ft. wide, and 7 ft. high. The machine is operated throughout by electricity, the digging and slewing motions being carried out by separate motors of 250 h.p. and 130 h.p. respectively. Current is supplied from separate generators each direct-coupled to a 375 h.p. motor.

Oil-Electric Paddle Ship

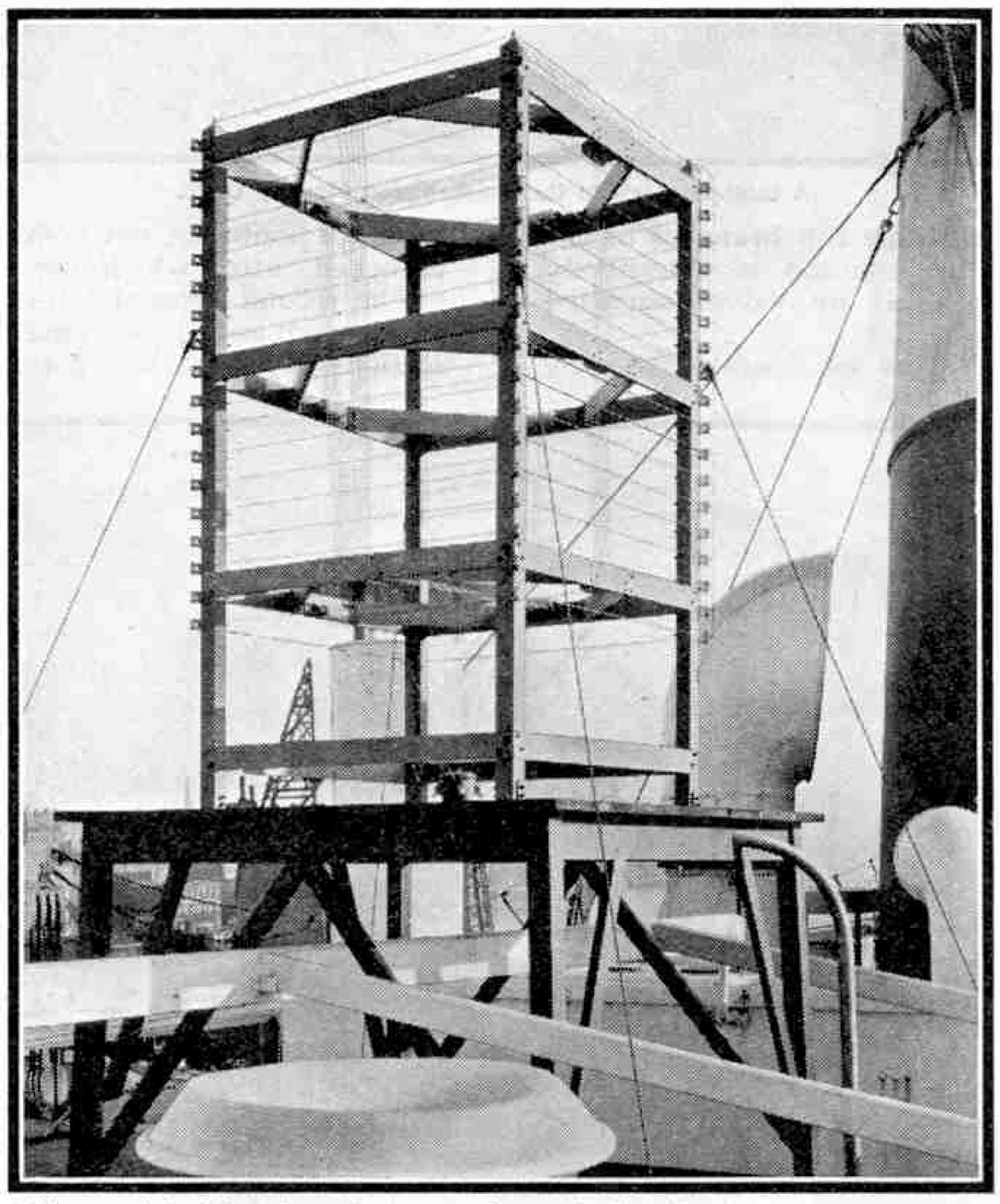
The old and the new seem to be combined in a passenger vessel that is being built for service on the Firth of Clyde, for although it is to be propelled by paddles, the paddles will be driven by oil-electric machinery. This method of propulsion has been selected because paddles will enable the vessel to manœuvre more easily in restricted places, and also because they are more suitable for use in shallow water. Oil-electric machinery was decided upon on account of its flexibility, and the fact that it enables the maximum space to be made available on the main deck and in the lower forward saloon.

The ship is being built for the L.N.E.R. by A. and J. Inglis Ltd. of Pointhouse, Glasgow, and the propulsion and auxiliary machinery will be installed by the English Electric Co. Ltd. The vessel will be about 215 ft. in length and 27½ ft. in breadth, and will cruise at a speed of about 17 knots.

It is an interesting point that only a few months ago two steamers built for service in the Firth of Forth were provided with paddles instead of screws. These were described on page 451 of our issue for June 1934.

World's Deepest Mining Shaft

A vertical shaft in a South African goldfield, that is to be completed by the end of 1936, will be 6,300 ft. in depth and, it is claimed, the deepest mine shaft in the world. The shaft was begun in July last, and it had reached a depth of more than 550 ft. by the end of the year.



This prosaic-looking piece of apparatus is a radio direction-finding device used on board ships and is described on this page. Our photograph is reproduced by courtesy of the Canadian National Railways.

The shaft will serve a mine that is 8,500 ft. below the surface. This depth will be reached with only one stage of inclined shafts.

Big Swiss Hydro-Electric Scheme

Work is now proceeding rapidly on a hydro-electric power station at Dixence, in Switzerland, which will provide power for the whole of the French-speaking section of Switzerland, an area of about 4,350 sq. miles. The plant will be one of the largest of its kind in the world, and will be made up of five units each consisting of one alternator driven by two Pelton wheels, with an output of about 21,250 h.p.

Radio Direction-Finding Apparatus

The illustration on this page shows one of the most important pieces of apparatus on board a modern ship, a radio direction-finder. This is of the type used on all the Canadian National Railways' West Indies liners. The wires that can be seen on the left and the right are in the plane of the ship's keel, while the other wires are at right-angles. These two sets of wires act as reflectors that receive at different angles beams from land wireless stations, and thus make it possible to tell just where the ship is so long as the stations received are known.

Ordinary commercial broadcasting is suitable for working the direction finder, but if necessary the wireless operator on the ship signals to a station and asks the operator there to broadcast for a few minutes to enable him to obtain the necessary information. Special stations situated all along the coast of Canada broadcast twice a day to give ships their positions, except during foggy weather, when they send out signals continuously.

Ploughing the Ocean Bed

Experimental work in connection with the laying of submarine cables on the ocean bed has been carried out by the Western Union Telegraph Company's cable ship *"Lord Kelvin,"* fitted with a special plough. Tests were made on the Devon coast, the method followed being to plough a furrow in the bed of the ocean and then to lay the cable in it. Successful attempts were made at depths of 200 ft. and 3,000 ft., and after the cable was buried it was found almost impossible to drag it up although special grapnels were used.

Fastest South American Liners

A number of Italian liners operating on the South American routes are to be equipped with new engines that will give them an appreciable increase in speed. The first two vessels to be dealt with are the *"Saturnia"* and *"Vulcania,"* both of 23,900 tons, and equipped with 20,000 b.h.p. twin-screw double-acting four-cycle oil engines. These engines will be replaced by two 12,000 b.h.p. Fiat units in each ship, which will increase the original speed of 18 knots to 20 knots. The conversion is to be carried out on the *"Vulcania"* next month and on the *"Saturnia"* in the Autumn.

Making Hay Without Sunshine

Sunshine is usually thought to be necessary to make hay, but the larger farms in the United States have for some time been successfully and profitably doing it with the aid of an artificial dryer developed by the International General Electric Co. of New York.

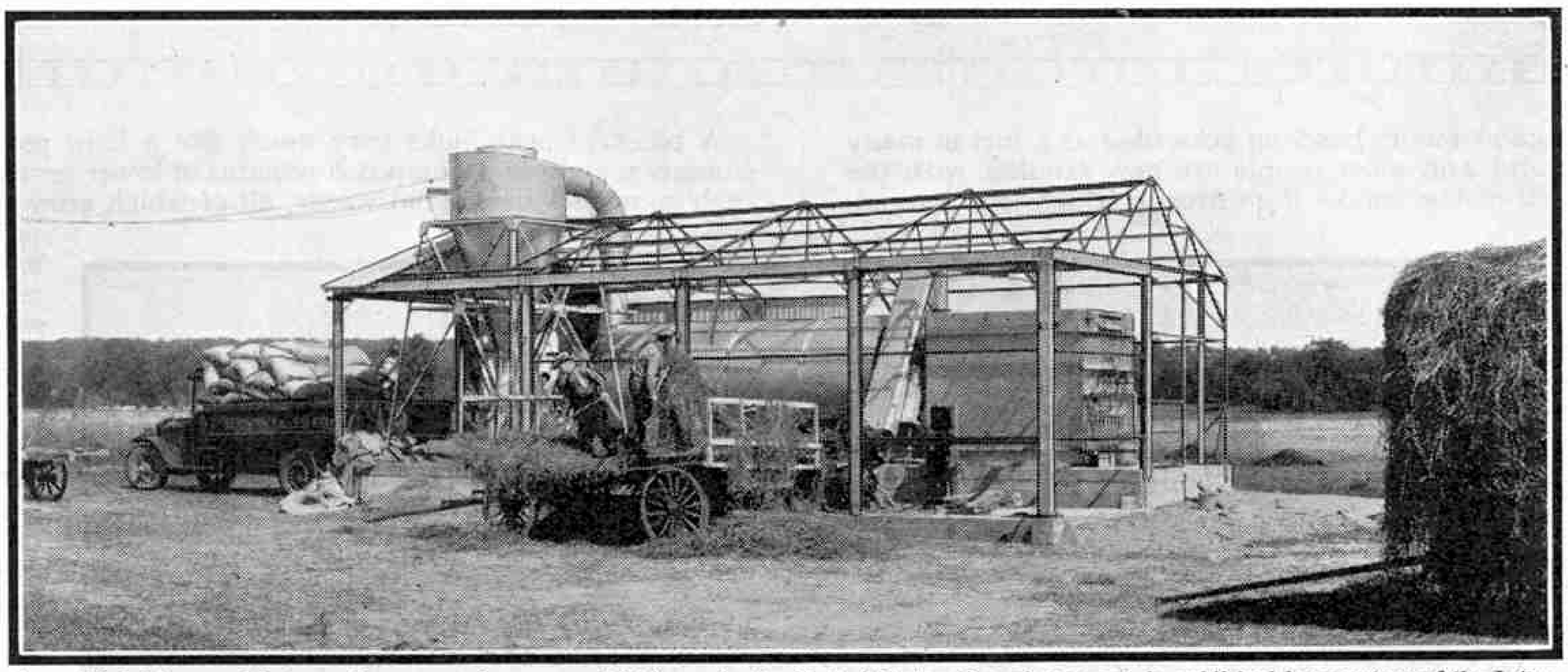
If a farmer has the necessary plant, he can be independent of the weather. During one exceptionally bad year for forage crops because of the excessive rainfall, one farm succeeded in making about 600 tons of dried alfalfa and mixed hay of high quality. It has been estimated that about one-half of the crop would have been lost, or of poor quality, if sun curing had been relied upon.

The artificially-dried hay is highly nutritious, because the leaves, which become wet with rain and are easily lost in sun curing, are saved. The crop as a whole is higher in protein and fat values and lower in fibre content. After drying, the hay can be stored indefinitely without heating, sweating, fermenting, or discolouring.

Experiments in the artificial drying of hay have been carried on for some time and the electrically-driven drying machine, known as an "airdryer," has been brought to a high degree of perfection, with interesting results.

Grass that is to be artificially made into hay is not put up into bales. After it has been mowed it is delivered to a cutter driven by a 20 h.p. motor, where it is chopped into fine pieces so that it is suitable for later automatic handling. The amount of moisture in the crop does not matter. The cut grass is next fed from the cutter to a revolving cylinder, 7 ft. in diameter and 20 ft. long. At one end of this is an oil furnace, and the grass and hot air are drawn through the cylinder, or dryer, by an exhaust fan at the outlet end. The dried hay is then delivered to a collector from which it is fed to a blower and blown directly into the barn. The cylinder of the dryer, and the blower are driven by motors or 25 and 10 h.p. respectively.

As a rule the artificial drying machine is set up as near the centre of the hayfields as possible, so that the wet forage need only be hauled a short distance. The hauling operation after drying is considerably easier, as the dry hay only weighs about one-third as much as in the preliminary stage. Another advantage derived from this chopping and drying process is that the whole crop is devoured by the cattle when it is cut up, no stalks being left. The dried hay retains its natural green colour.



An artificial hay making machine as used on many big farms in the United States. Our photograph is published by courtesy of the International General Electric Co. of New York.

Bridge News

At present there seems to be much activity in the construction of bridges in various parts of the world. The world's longest bridge, for instance, has recently been opened across the Zambesi River in South Africa, and we hope to publish an illustrated description of it in an early issue. The world's largest welded bridge has also been opened. This spans the River Abushka at Stalinsk in Russia, is 29 ft wide, and its longest span measures nearly 220 ft. The largest welded bridge was previously at Dresden, the longest span of this structure being 85 ft. and the width 38 ft.

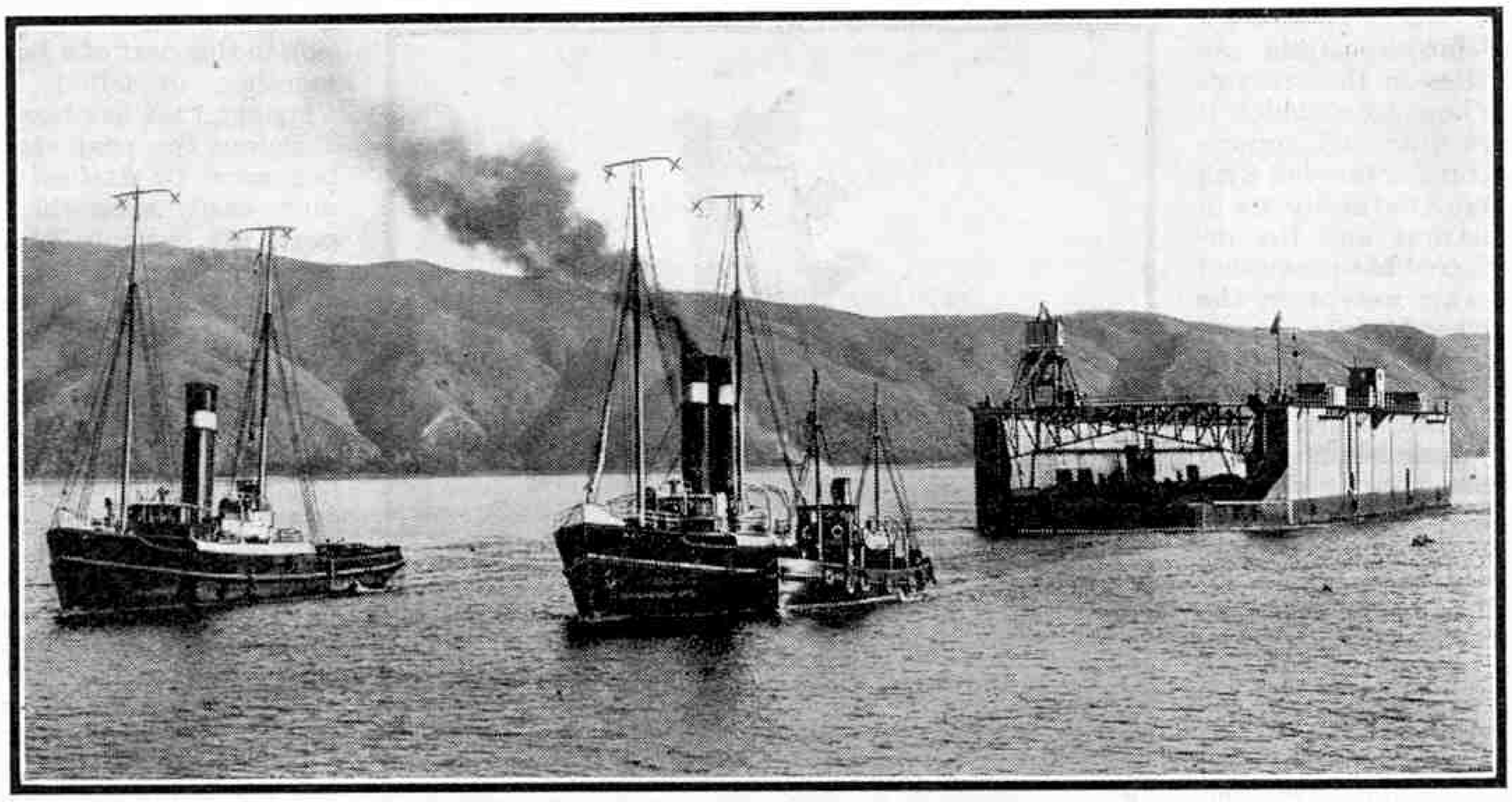
Work is also proceeding steadily on the important new Golden Gate bridge connecting San Francisco and Oakland in the United States. Such satisfactory progress is being made that it is anticipated that the stringing of the wire in the suspension cables will be started next month. Three of the four towers on the west side of the bay are already completed.

The engineers had intended to use a caisson when constructing the south pier of the bridge, but after having built the caisson and floated it to the site, it was eventually decided to dispense with it. A cofferdam was built round the site of the pier, and when this was finished it was sealed and the water pumped out.

Engineering Progress in Russia

What is claimed to be the largest machinery-building works in the world has been opened in Russia. The foundries of this plant are capable of dealing with 57,000 tons of work a year, and the machine shops have a capacity of 35,000 tons a year. Although the plant has been working for only a few months it has already made a number of cranes, crushers, rolling mills, castings for turbines and other large units, which previously had to be imported from abroad. It was in fact estimated that by the end of December last the works would have produced 25,000 tons of finished products, 342 tons of blast furnace equipment, 3,683 tons of equipment for open hearth furnaces, and 7,470 tons of rolling equipment, in addition to 33 cranes, 10 lathes and various other machines.

Another interesting Russian engineering works is being erected at Kashira. This plant will be devoted to the production of electric locomotives, and it is estimated that it will have a yearly capacity of 400 locomotives, 400 tenders, and 10,000 tons of spare parts. Of the 400 locomotives to be built yearly, 300 will be for main line work.



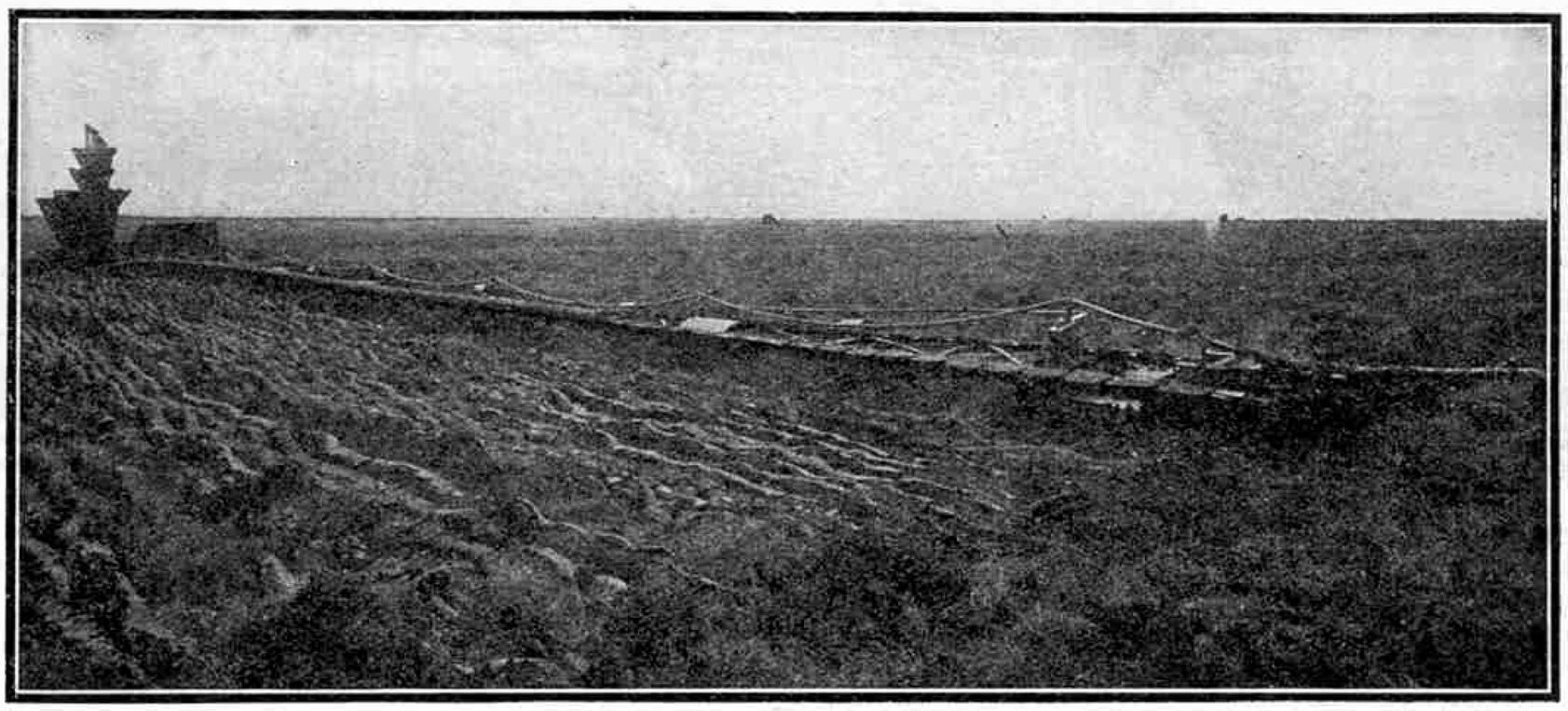
Dutch tugs towing a 17,000-ton floating dock from the Tyne to Wellington, New Zealand, a distance of 13,000 miles. This illustration is published by courtesy of Messrs. Clark and Standfield. An article on floating docks appears on page 4 of this issue.

Power from Peat Bogs

New Processes Yield Valuable By-Products

By W. E. Glover

PEAT from bogs and moors has long been used as a fuel in many parts of the world and most people are now familiar with the characteristic smell of the smoke from fires in which it is burned. There are enormous deposits of peat in many countries. Bogs from which it can be cut cover millions of acres in Ireland and large quantities are to be found on the moors that abound in England and Scotland. Even more extensive supplies are available in Sweden, Germany and other European countries, and also in Canada.

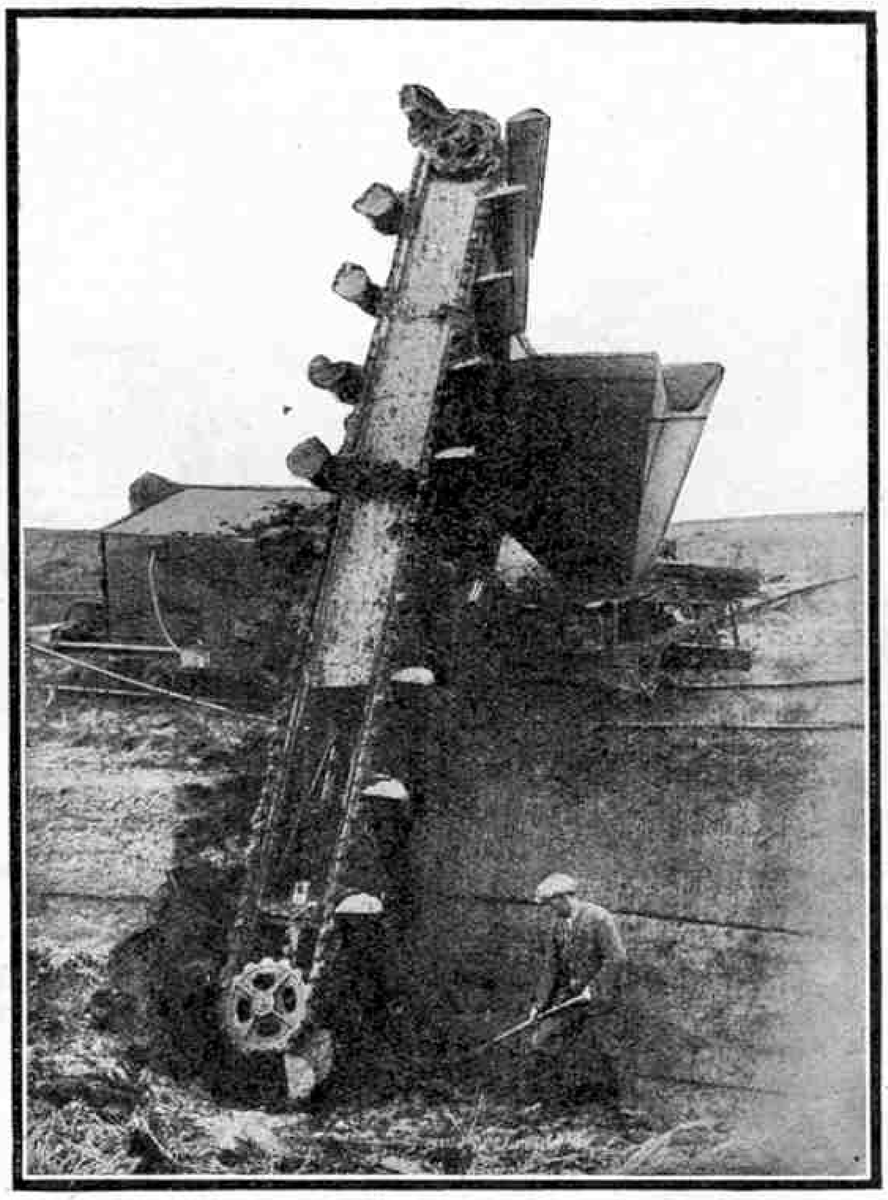


Conveyor spreading peat over the surface of a peat bog to dry at the Turraun Peat Works, Ireland. We are indebted to the Leinster Carbonising Co. Ltd., for the illustrations to this article.

At present peat is a minor fuel and the deposits have not been worked to any great extent. There are several reasons for this. One is that better fuels can easily be obtained. Peat contains as much as 80 per cent. to 90 per cent. of water and is both lighter than coal and of less heating value, being only slightly better than wood in this respect. In addition it contains a large proportion of incombustible ash derived from impurities in the streams running through the bogs from which it comes, for it acts as a filter and impurities in the stream become entangled with it. Most of the peat bogs naturally are in thinly populated districts and the inferiority of the fuel to coal has prevented its use on a large scale except in the immediate neighbourhood of its source.

Peat is likely to become of increasing importance in spite of its present disadvantages, for our resources of other fuels are steadily diminishing. Many experiments have been made to find the best means of using it. Some of these have led to no useful results, but more recent efforts seems to have been comparatively successful and now there are good prospects of the production from natural peat of a useful fuel at reasonable cost, together with cheap power gas and valuable by-products.

Experiments on peat, whether immediately successful or not, are well worth the money spent on them when the amount of peat in the world is taken into consideration. In the British Isles alone there are more than 2,000,000 acres of peat bog, but this is small in comparison with the 140 million acres in Europe and even with the 30 million acres known to exist in Canada. Our peat supplies in fact form an enormous prospective source of power. It has been estimated that in Ireland alone the available peat is equivalent to 2,500 million tons of coal, and peat therefore is a fuel with enormous possibilities if economical means can be found of extracting it and preparing it for use.



Automatic machine at work excavating peat.

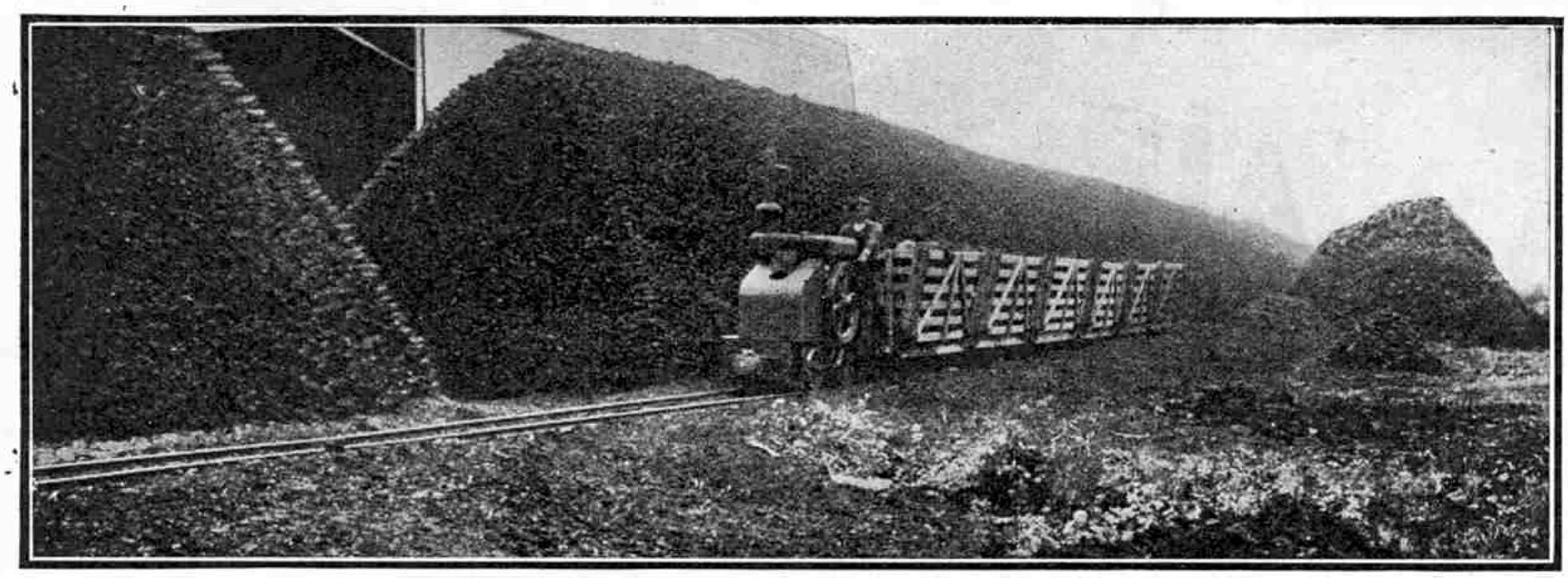
A block of peat looks very much like a hard piece of turf. It consists mainly of decomposed remains of lower forms of plant life, such as mosses, reeds and weeds, all of which grow profusely in a temperate climate if given an abundance of water. As the upper part of a piece of moss continues to grow the lower part dies off, so that in time a thick deposit of dead plant matter is formed. Examination of moss that has been growing for several years reveals this at once, for only the top is green and below is a crumbly dead mass. The under portions of typical bog plants begin to decay as they are buried more deeply in the swamps in which they grow and at last lose their vegetable characteristics and become a brown or black semi-solid mass, in which the strands are pressed close together by the weight above them. The upper portions have no great weight bearing down upon them, but the dead vegetation in this part of a bog becomes matted together, or felted, and it resembles a sponge that has been soaked in water.

Before the peat can be removed the bog must be drained to make the fuel more easily accessible. Then the upper parts are cut into blocks that are first spread out and later stacked in the open and left to dry. The proportion of water is then slowly reduced to about 50 per cent., or even less, and the dried peat can be used as fuel for open fires.

Irish farmers and peasants treat peat in this manner, cutting the blocks from bogs on their own holdings or from others a few miles away where they have secured cutting rights. They use what is called a "wing slane," which is simply a sharp spade with an additional cutting wing 6 in. wide at right angles to one edge of the blade. This is thrust downward into the bog six inches behind the vertical cutting face and its two sharp edges detach a block about 12 in. long and 6 in. wide that is pitched on to the surface of the bog to dry. The peat is cut and spread in the spring and as drying proceeds it is built up into stacks, to be carted home after the harvest, usually by women and children.

This primitive way of obtaining peat is interesting but is scarcely a commercial process and the blocks dug out by means of the wing slane are easily broken up, since they are cut at right angles to the fibres of the peat. Blocks that can be transported with less liability to damage are cut horizontally, so that their fibres hold the mass together. Such blocks are won from Irish peat for transport and sale at a distance from the bogs of which they once formed part.

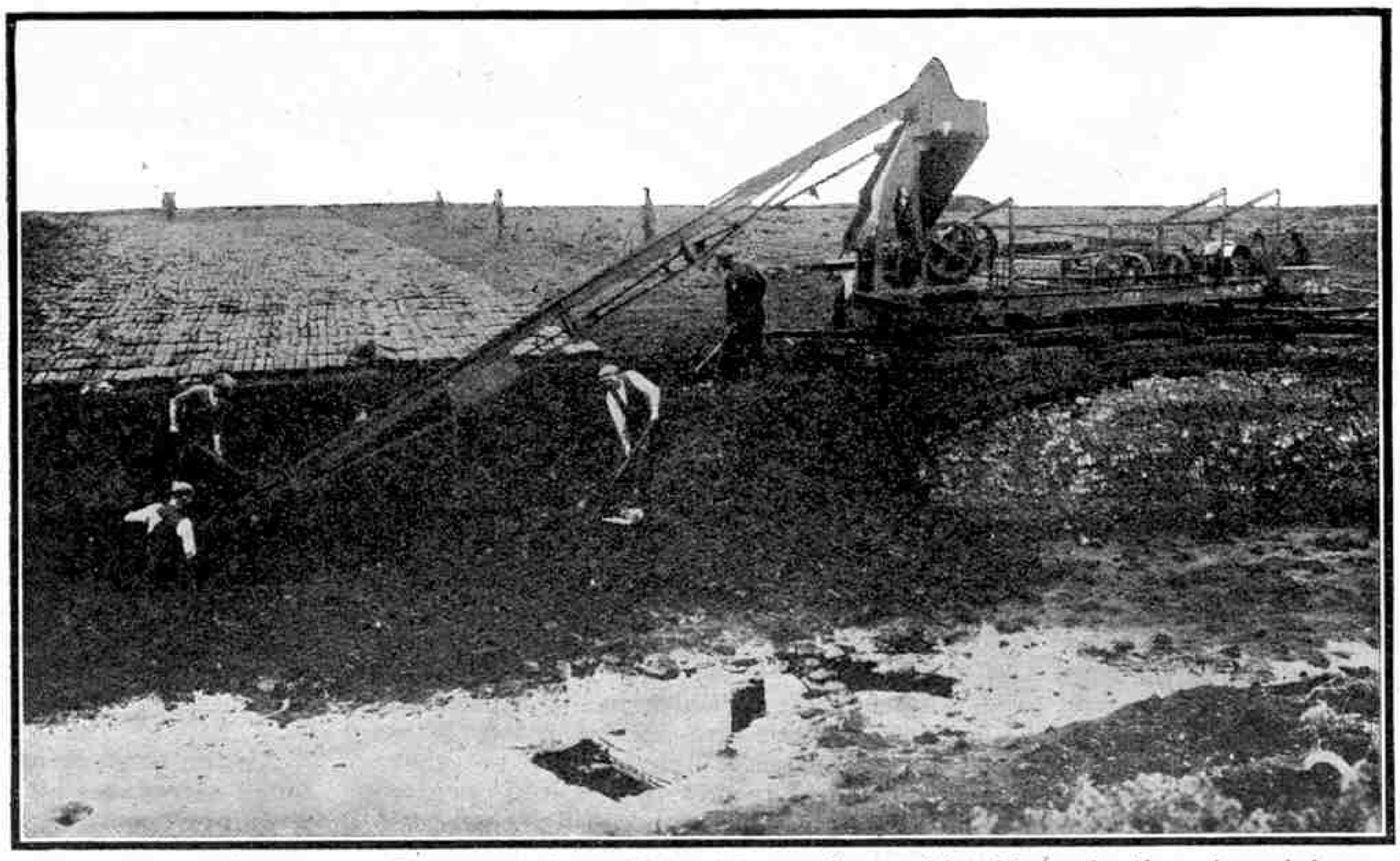
The winning of peat by hand labour is a costly process and is not very productive. Many different forms of machines for extracting the peat and spreading it out to dry therefore have been introduced, especially in Sweden and Germany. Similar methods have been adopted in dealing with Irish bogs, and our illustrations show operations at the Turraun Peat Works in Central Ireland. There an automatic machine is employed to dig out the peat, which is delivered to the travelling belt of a spreader that distributes it over the surface of the bog in rows like the furrows of a plough field. The machine is electrically driven by means of current distributed through overhead wires radiating from a central station. The generator gives current at 2,500 volts and the boiler supplying the necessary steam is itself fired by peat.



Stacks of peat at the Turraun Peat Works. The light railway is used to haul raw material and to convey the finished product to the canal on which it is transported to Dublin and elsewhere.

A semi-automatic machine in use at the Works breaks up the peat, which is brought to it by means of an elevator fed by hand at the bog face, and the product is then converted into special blocks of uniform size and shape. The trenches cut by the machines are from a mile to a mile and a half in length. Each machine excavates about 10 miles of trench in a season, and the total output is about 8,000 tons of fuel.

Spreading the peat to dry is costly because of the immense area of ground covered by large outputs, and many interesting machines have been introduced for the purpose of reducing expense. An interesting system is used in the Canadian Government peat bog at Alfred, Ontario. There peat excavated by dredges is first cut up and mixed by the rotating knives of a macerator, and then transferred to buckets on an overhead telpher with movable supports. In the skips or buckets of this telpher it is carried to the place where an electrically-driven spreading machine supported on creeper track is working. There it is delivered into a hopper to be distributed uniformly over the ground by nozzles through which it is forced by means of a screw conveyor.



A semi-automatic macerator. The conveyor is hand fed and the peat is pressed into blocks of uniform size and shape.

The removal of moisture from peat is a very troublesome matter, for even a well drained bog may yield peat containing as much as 90 per cent. of water. This means that there are in it from seven tons to eight tons of water for every ton of peat substance. The proportion of water of course varies according to the depth from which the peat is taken. The upper layers contain the lowest proportions, but those lower down usually are so wet that they are not of suitable consistency to be cut into blocks and taken away for drying. Instead they are removed by machines of the type already described, and pressed and cut into blocks after drying. The lowest portion of all is very slimy and is simply pumped out and spread on the land to dry.

The season of the year and climatic conditions affect the drying of peat. Except in winter, peat left for six to eight weeks usually is ready for use and the proportion of moisture is then reduced from 90 per cent. to between 20 and 30 per cent. in summer, and 40 per cent. to 50 per cent. in autumn and spring. Artificial drying usually is too costly, since the expense of the fuel required is not returned in increased value of the product. Further disadvantages of artificial heating are that peat chars on the outside and loses valuable volatile constituents if it is not heated very slowly, or if too high a temperature is used.

The composition of dried peat does not vary greatly, whatever its source. In addition to ash and water it contains from 56 per cent. to 63 per cent. of carbon and about 6 per cent. of hydrogen. There are also small proportions of sulphur and nitrogen, the second of these constituents being important because of the useful by-products to which it gives rise. A greater proportion of nitrogen usually is found in the soft bottom section of the bog than in any other layer and this section also contains most ash, which may be present to the extent of as much as 10 per cent.

Many different plans have been proposed for the commercial preparation of peat in order to encourage its use as a fuel. Peat briquettes are made at many places, but chiefly at Brondesley, in Denmark. These are of the same shape as the more familiar briquettes made from coal dust, but are much harder and do not crumble easily. The reason for this difference is that waxy substances contained in peat act as binders when this material is heated and pressed, while on the other hand coal dust requires the addition of a binder such as coal tar. This method of utilising the peat may be developed further, since the briquettes take up much less room than those obtained from coal and thus are a more compact form of fuel.

A second way of making use of peat is to burn it directly in the form of a dry powder. In preparing this a dried peat containing about 40 per cent. to 45 per cent. of moisture is crushed and ground as finely as possible, and is then dried further by passing it through long heated chambers. This treatment reduces the proportion of water to less than 15 per cent. and crushing and sieving then gives a fairly fine powder.

Peat powder is used extensively on the Swedish State Railways. It is carried in airtight tanks fitted to the (*Continued on page 42*)



British Air Mail Speeds

Since the MacRobertson Trophy races, so much has been written and talked about the question of speed on the British long-distance air routes, that many people have gained the firm impression that the Imperial air mail services take at least twice as long as foreign services to reach a common destination! Some details taken from *"Bradshaw's Air Guide"* are therefore of interest.

According to *"Bradshaw,"* an Imperial Airways liner takes nine days to get to Singapore, while the K.L.M. service, which keeps pace with the British one as far as Bangkok, takes two days to get from Bangkok to Singapore, making 10 days in all, or one day longer than the English service. The only other service operating to the east is flown by Air France, and this only goes as far as Bangkok, taking 10 days for the journey. Thus a letter posted by Imperial Airways service to the present terminus at Singapore would reach its destination in a shorter time than by any other service.

It should be borne in mind that the magnificent performances in the recent speed contest to Australia were under racing conditions, and could not at present be regularly achieved by any air transport concern on this route under service conditions.

Rotors for Dornier Machine

For a long time illustrations of "the aeroplane of the future" have usually shown a big air liner provided with horizontal rotors for taking off and landing, but at other times stowed away in special receptacles. It is therefore interesting to note that the German Dornier company have recently taken out a patent for a similar attachment intended to assist high-speed aeroplanes fitted with small wings, on taking off and landing. As soon as the aeroplane is in the air, rotor blades are folded up like an umbrella, and the rod that carries them is retracted into the fuselage and kept there until it is time to land.

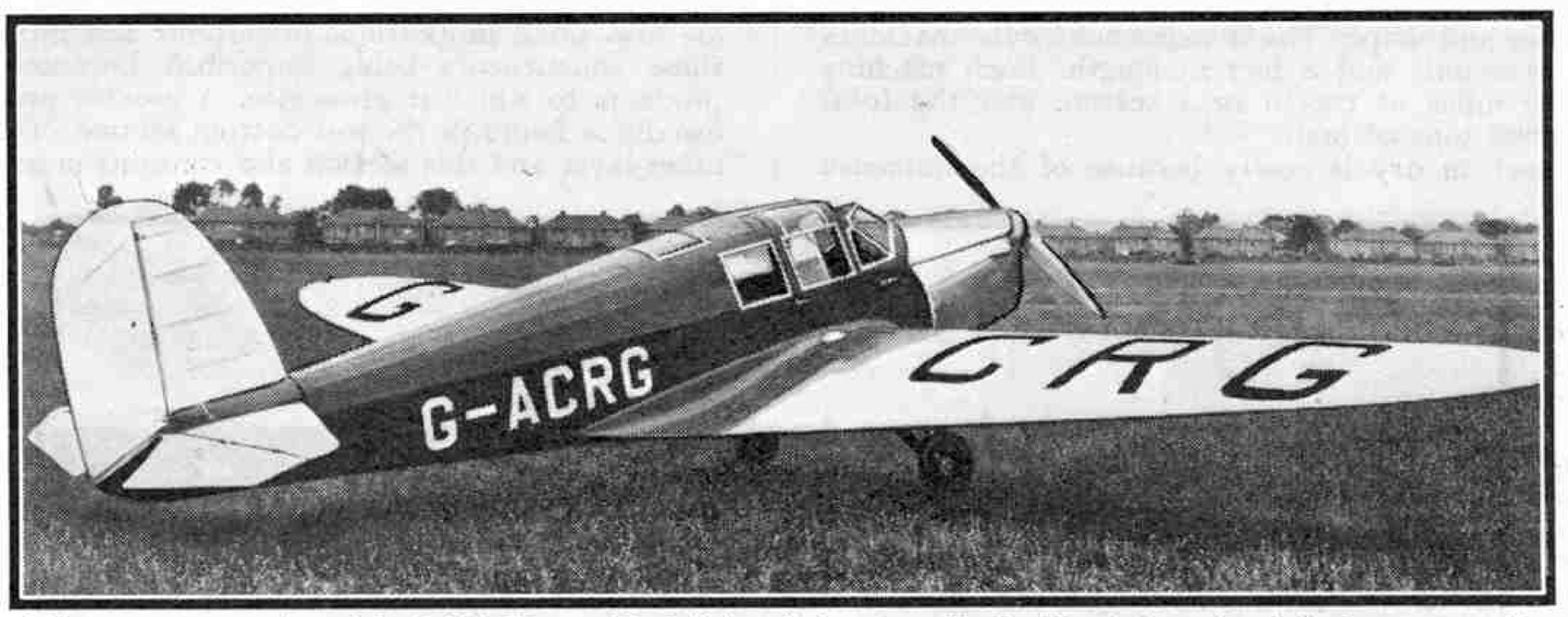
Railway Air Services

The passenger, mail and freight services operated by Railway Air Services Ltd. on behalf of the L.M.S.R., between London, Belfast and Glasgow and vice-versa, is to be continued this year. Since 1st November last a service has been operated between London, Liverpool and Belfast on the main route, with a connecting service between Belfast and Glasgow. The departure from the airport of London is scheduled to take place at 10.15 a.m. and the arrival at Belfast at 1.30 p.m. The connecting service is due to arrive in Glasgow at 2.55 p.m.

The Liverpool-Plymouth and Birmingham-Cowes services have been discontinued for the winter, as also has the London-Cowes service operated on behalf of the Southern Railway.

Diesel Engines for Flying Boat

Three Napier "Culverin" compression ignition engines are to be fitted in a Blackburn "Iris" flying boat so that information as to how the engines operate under actual service conditions can be obtained by the Air Ministry. The experiment is an extremely interesting one and may have far-reaching effects, as Diesel engines appear to be particularly suitable for use in flying boats. The saving in fuel that can be achieved by using a Diesel engine is not noticed unless the machine is able to travel for at least seven hours without refuelling, and as flying boats are specially designed for long distance non-stop flights, the combination of the two should be admirable. It is thought that when the "Iris" is in service with its new engine it will be able to make non-stop flights from England to Gibraltar with ease.



A three-quarter rear view of the British Klemm "Eagle," described on page 12. For this photograph and the lower one on the opposite page we are indebted to the British Klemm Aeroplane Co. Ltd.

Variable Pitch Airscrews

During the last few years much attention has been given to the problem of producing a serviceable airscrew the pitch of which could be varied as required. The need for such an airscrew is obvious, for it acts in the same way as the gear-box of a motor car, being adjusted to the best pitch for climbing and then the most suitable for ordinary straight flying.

As most of our readers will know, the D.H. "Comet" in which Scott and Black won the MacRobertson air race was provided with a variable pitch air screw. This was limited to two pitch positions, however, one for taking off and climbing, and another for cruising and high speed, and the change was made by diving the machine as soon as a reasonable height was reached. It was then impossible to alter the pitch again without landing.

The latest development of this airscrew has an infinite number of pitch positions that can be selected and brought into use while the machine is in the air. Actually the screw is designed so that it will automatically come to the pitch best suited for the particular flight combination at any instant. We hope to publish further details of this interesting airscrew in an early issue.

A Novel Launching Scheme

An amazing scheme for launching heavily laden aeroplanes by carrying them up into the air on special bigger machines and there releasing them, is now being experimented with by Short Bros. (Rochester and Bedford) Ltd., for Imperial Airways Ltd. who may employ it to operate a trans-atlantic mail service. The fact that two such responsible firms are taking part in the experiment shows that, fantastic as the scheme may seem, it has sound possibilities.

The new scheme would make it possible for a seaplane designed for flying level at high speeds to be carried to the best cruising altitude, where it would pull itself off the carrier machine and fly to its destination with a much greater load of fuel and mail than it could possibly lift off the water.

Remarkable Long-Range Radio

Some remarkable reports have recently come to hand of long-range radio reception between British air liners and ground stations, and also between air liners in flight. The other day, for example, an amateur operator at Victoria West, Cape Province, South Africa, picked up messages sent out by the air liner *"Astræa,"* of Imperial Airways, when that machine was flying between Alor Star and Singapore, in Malaya. The distance between the aeroplane in flight and the station picking up the message was approximately 5,200 miles. The signals from the air liner, which were routine messages on a short wavelength transmitted while the machine was making a night flight, were received so well by the amateur at Victoria West that they came through at loud-speaker strength.

While one of the aeroplanes on the Africa air mail was flying near Mpika not long ago, its operator got into radio touch with another machine on the same route which, at the time, was flying at a point 2,000 miles distant, communication being maintained for several minutes without fading or interference. On another occasion, while an Imperial Airways machine was making an aerodrome survey along the route from England to Australia, its operator established communication with the Sydney radio station at a time when the aeroplane was in flight more than 5,000 miles from that city.

Another similar instance occurred during tests with an improved type of short-range radio apparatus, when a machine flying above the White Nile, between Juba and Kampala, managed to establish communication over a distance of 4,000 miles with a station in England. During the same trials one of the operators while over Central Africa picked up and could hear quite plainly a news broadcast from a station at Miami, Florida. Long-range contacts were established also with stations in Germany and Italy; while Cairo received short-wave messages, without any fading, from a machine more than 1,000 miles away, flying southward towards Capetown.

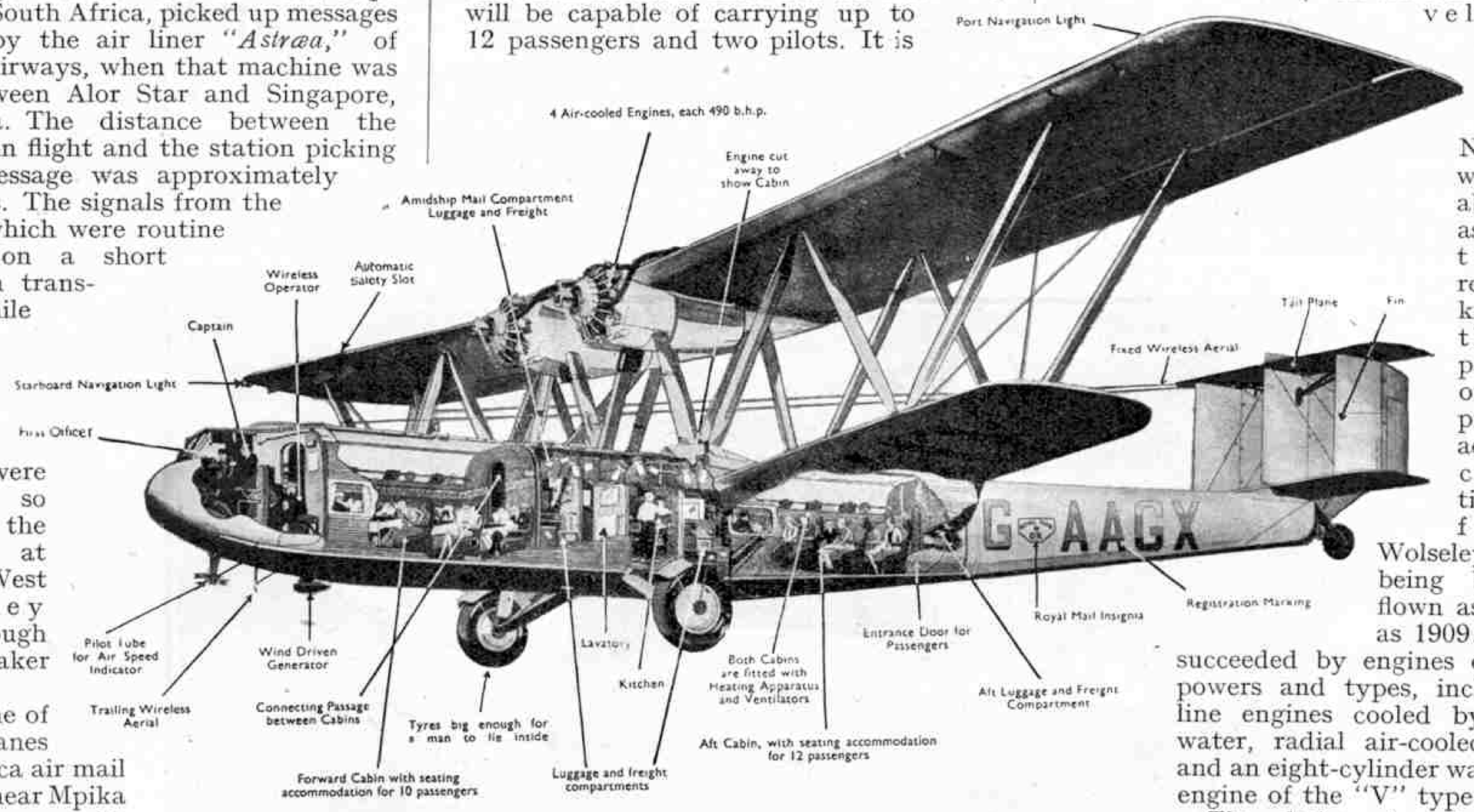
As yet another example of such long-range reception the fact may be mentioned that the result of last year's Derby was picked up by the operator in an Imperial Airways liner when the machine was flying between Baghdad and Basra. He communicated it at once to the passengers who, although they were at the moment high above the desert, thus became aware of what had won the race within a minute or so of the finish on Epsom Downs.

A High-Speed British Air Liner

A new twin-engined air liner of the low wing type, capable of cruising at a speed of 175 m.p.h., is now under construction by the Blackburn Aeroplane and Motor Co. Ltd. The machine, which has not yet been named but is known as the H.S.T.10, will be capable of carrying up to 12 passengers and two pilots. It is of metal construction, and a feature is that the wings employed are built on a new principle that makes use of only a single spar. This enables a considerable reduction in constructional weight to be made, thus automatically increasing the pay load. The method of wing construction was described on page 865 of our issue for November 1934.

The new air liner is exceptionally clean in design and embodies all the latest improvements. The undercarriage, for instance, is retractable, and a unique feature is that the tail wheel fitted also can be lifted up into the fuselage once the machine is in the air. It will be the only machine yet built in this country with such an arrangement. The engines employed will be two Napier "Rapier VI" moderately supercharged 16-cylinder "H" type air cooled. These engines, which develop 305 h.p., are noted for their small frontal area.

The H.S.T. will have a span of 57 ft. 4 in. and will be 42 ft. in length. The passengers' cabin will be 18 ft. long, 4 ft. 4 in. wide, and 5 ft. 6 in. high. The tare weight, including the two pilots, will be 5,529 lb., and the all-up weight 8,600 lb. At an altitude of 5,500 ft. the machine will be capable of travelling at a maximum of 204 m.p.h. and will cruise at 175 m.p.h. The landing speed will be 63 m.p.h.



A sectional drawing of a machine of the Handley-Page "Heracles" type owned by Imperial Airways Ltd., to whom we are indebted for this illustration.



The British Klemm "Eagle" in flight with the undercarriage raised. If the undercarriage were left down the speed of the machine would be reduced by 18 m.p.h.

New Radial Engines

Two radial aero engines of new design are now being produced by Wolseley Motors (1927) Ltd. The re-entry of the Wolseley Company in the field of aero engine manufacture marks a further step in the company's development since it was acquired by Lord Nuffield. It will probably come as a surprise to many readers to know that the company was one of the pioneers in aero engine construction, the first Wolseley engine being built and flown as long ago as 1909. This was succeeded by engines of various powers and types, including in-line engines cooled by air and water, radial air-cooled engines, and an eight-cylinder water-cooled engine of the "V" type.

The choice of engine for the present series was a matter for careful consideration, and the radial air-cooled type was eventually selected as it possessed the advantages, as compared with other forms of construction, of low specific weight, accessibility and consequent ease and low cost of maintenance, ease of installation in an air frame, uniform cylinder cooling, and the ability to operate in any temperature or climate without trouble. The radial engine is also of compact design, having a short crankshaft that is much less subject to torsional vibration trouble than are crankshafts of the multi-throw type.

The two engines so far produced are the A.R.9 and the A.R.7. The first of these is of the nine-cylinder type and normally develops 185 h.p. at 2,200 r.p.m. It has a maximum output of 203 h.p. at 2,420 r.p.m., a fuel consumption of nearly 12½ gallons an hour, and weighs 452 lb. The Wolseley A.R.7 is similar to the A.R.9 except that it has only seven cylinders. It normally develops 145 h.p. at a speed of 2,200 r.p.m., but may be run for short periods at 2,425 r.p.m. when it develops a maximum of 162 h.p. The normal fuel consumption is about 10 gallons an hour and the engine weighs 320 lb. when in service condition.

New American Semi-Rigid Airship

An airship that has recently been built in the United States is the biggest of the semi-rigid type at present in use in that country. It is already in service, being used for scouting and observation training work. The airship is 245 ft. in length and 50 ft. in maximum diameter and has a capacity of 400,000 cu. ft. It has accommodation for 16 people, is equipped with machine guns and is driven by two engines, each of 300 h.p.

British High-Speed Monoplanes

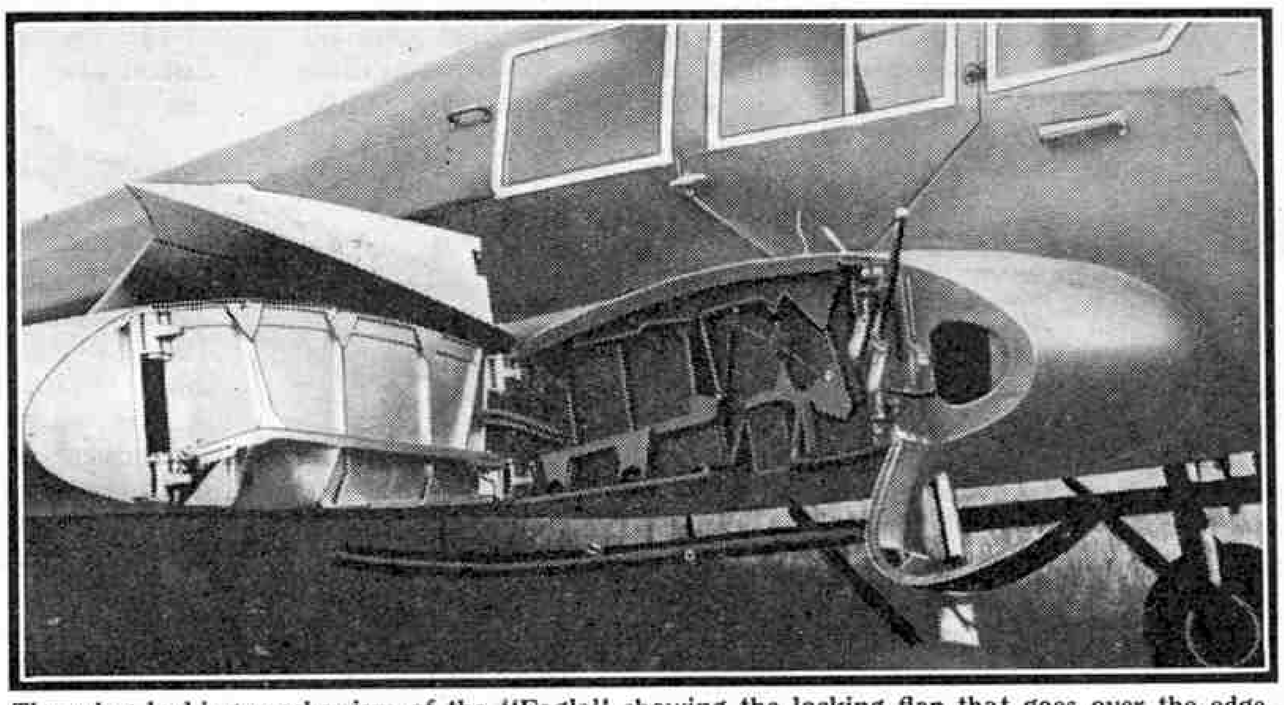
Cabin Machines that Cruise at 150 m.p.h.

ALTHOUGH Britain was successful in winning the Schneider Trophy and holding for a short time the world's air speed record, British aircraft constructors have lagged far behind the aeroplane builders of other countries in regard to small high-speed civil machines. One of the reasons for this is that such machines usually cost more to buy and to operate than slower ones, and as distances are so short in this country, the saving in time that can be effected with them does not make up for the increase in cost. In countries such as America, however, an extra few miles on the cruising speed of a machine may save hours on a cross-country flight, which is of course worth paying extra for.



The British Klemm "Eagle" in flight over the Thames. The engine employed is a D.H. "Gipsy Six." For the photographs on this page we are indebted to the British Klemm Aeroplane Co. Ltd.

During the last few years it has been realised that if British machines are to secure orders in foreign markets they must combine the reliability and strength for which they are so world-famous with a factor for which they are not so noted, namely, speed. As a consequence, more attention has been paid to streamlining, and many high-speed machines have been produced, most of them being monoplanes. In this article we intend to describe two of these new high-speed civil machines, the Airspeed "Envoy" and the British Klemm "Eagle."



The wing locking mechanism of the "Eagle" showing the locking flap that goes over the edge. Other photographs of this interesting machine are published on pages 10 and 11.

Both of these types are low wing monoplanes, but they are quite different in most other respects. The "Envoy," for instance, is a cabin machine capable of carrying up to six or eight passengers, and has two engines carried in nacelles mounted on the wings, one on each side of the fuselage. The British Klemm "Eagle," on the other hand, is of the single-engined type and can only carry three passengers. In both types, however, arrangements are made so that the whole of the undercarriage can be lifted up and stowed in the wings once the machine is properly in the air.

The "Envoy" is made by Airspeed Ltd., the constructors of the well-known "Ferry" and "Courier" machines that have already been described in these pages. It follows closely on the lines of the "Courier" except that the "Courier" is a single-engined machine. While this arrangement is very suitable for many purposes, most modern commercial air line operators require their liners to be of the multi-engined type, capable of maintaining height with full load when one engine is out of action. With these requirements in view, the "Envoy" has been produced to supplement the "Courier." It should appeal to the operators of unsubsidised or "feeder" air line services, as it is economical in initial, maintenance and running costs, while at the same time it has a comparatively high performance.

As a result of the actual flying experience gained with the "Courier," various modifications have been carried out on the "Envoy," and in particular a much quieter cabin has been secured. Another important feature is that from the pilot's cockpit there is an exceptionally good view in nearly all directions, which gives the pilot a sense of security that is of great value when flying in thick weather.

The "Envoy" is fitted with two Wolseley AR9 engines, which are described on page 11 of this issue. They give it a maximum speed of 170 m.p.h. and a cruising speed of 150 m.p.h., in spite of which the machine lands at only 61 m.p.h. When taking off against a wind of 5 m.p.h. a run of only 250 yds. is needed to get into the air, and when landing in a similar wind

the machine pulls up without brakes in 180 yds. At cruising speed, 21 gallons of fuel are consumed in an hour, which is equivalent to travelling a little more than 7 miles for every gallon of petrol.

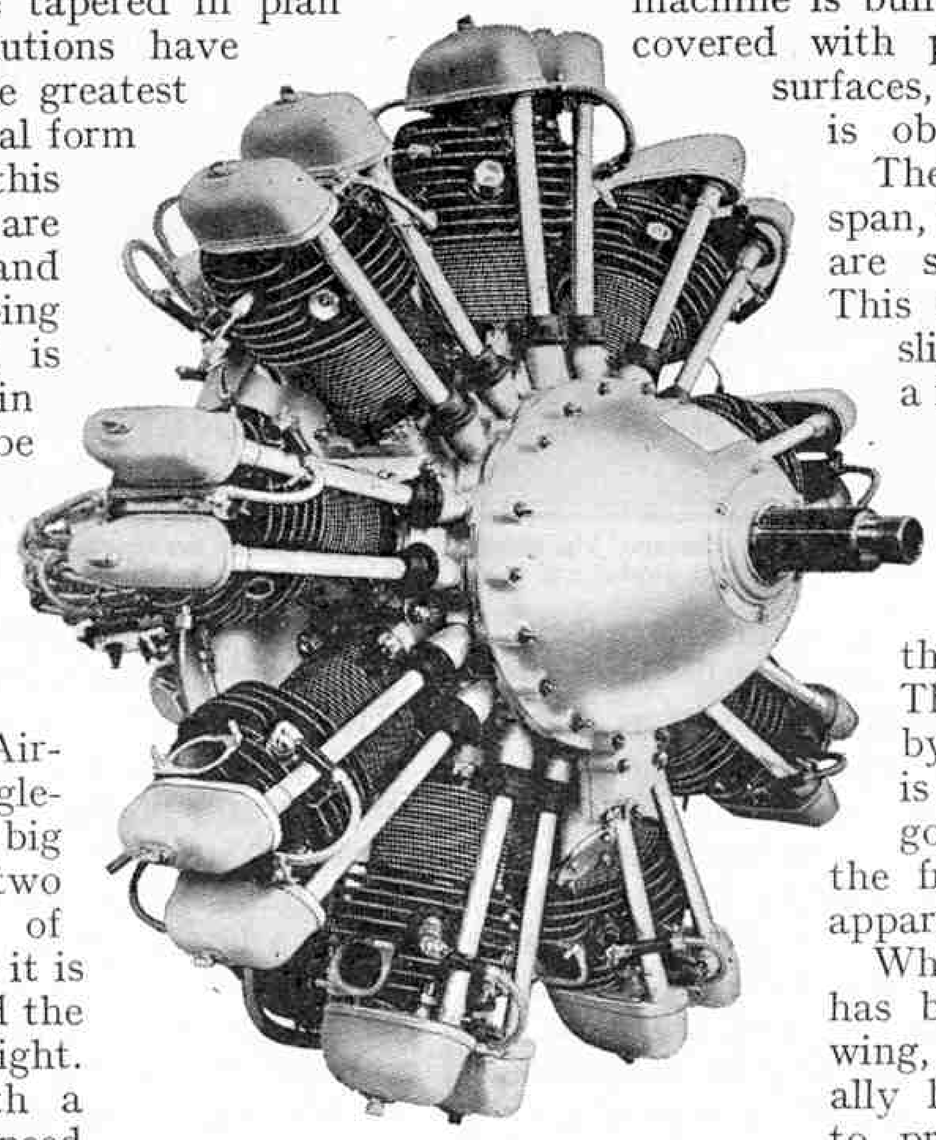
The fuselage of the "Envoy" is made of wood and is built on the semi-monocoque system. This means that the fuselage consists of a number of transverse members cut to the shape required and spaced out at intervals by means of wooden rails or bars, the whole being covered with fabric. This ensures exceptional rigidity, and eliminates any tendency towards the development of tail flutter. The fuselage is built in two sections, the front unit containing the passengers' cabin and the pilot's cockpit, while the rear section carries the empennage, which is particularly strong and clean, having no external wires or struts either for support or to operate the controls.



An impressive view of the Airspeed "Envoy," showing its similarity to the single-engined "Courier." The machine cruises at 150 m.p.h. and lands at 61 m.p.h. Photograph by courtesy of Airspeed Ltd.

The wings of the "Envoy" are tapered in plan and elevation and special precautions have been taken to impart to them the greatest possible amount of rigidity, a special form of bracing having been devised for this purpose. The main plane spars are of orthodox box construction, and standard fabric covering and doping schemes are employed. When it is desired to house the aeroplane in a small space, the wings can be easily detached from the centre section by moving four large bolts and the connections between the joy stick and the controls.

The second machine to be described this month, the British Klemm "Eagle," differs from the Airspeed "Envoy" in being of the single-engined type and being only big enough to take one pilot and two passengers. This makes it more of an owner-pilot's machine, although it is also very suitable for taxi work and the carrying of mails and express freight. When the machine is fitted with a "Gipsy Six" engine it has a top speed of about 170 m.p.h. and cruises comfortably at 148 m.p.h., although in spite of this the landing speed is only about 48 m.p.h. The range is 600 miles. Another model, equipped with the "Gipsy Major," has a maximum speed of 148 m.p.h., cruises at 130 m.p.h., and lands at 45 m.p.h. Its range is 650 miles.



A Wolseley engine similar to that used in the Airspeed "Envoy" shown above. A description of the Wolseley engines is given on page 11.

There are several exceptional features in the "Eagle," the most important being the retractable undercarriage. This is not arranged to be lifted up vertically as are most English undercarriages of this type, but, by turning a handle in the cockpit, is lifted up sideways until each wheel and leg is completely encased in a special receptacle provided in the wing.

The "Eagle" is made by the British Klemm Aeroplane Co. Ltd., formed in 1933 to acquire the sole license to manufacture in this country the German Klemm machines. It is the first machine to be produced, but preparations are already well on the way for a second, which is to be known as the "Swallow." It will be equipped with British engines.

The "Eagle" is a low wing cantilever monoplane of exceptionally clean design, which has been brought about by reducing the external fittings as much as possible.

The forward section of the fuselage is of steel tube construction, as with this material the cabin and the doors can be shaped exactly as desired. The rest of the machine is built almost entirely of wood and is covered with plywood except for the control surfaces, for which a covering of fabric is obviously more suitable.

The wings, which are 39 ft. 3 in. in span, taper in chord and thickness and are set at a slight dihedral angle. This means that they slope upward slightly from the fuselage to the tips, a fact that increases the stability, or steadiness, of the machine when in the air. The wings are arranged so that they can be folded back, in which condition the overall width is only 14 ft. 10 in., or less than half their span when spread. They are normally kept in position by a single lever at each side that is locked in position by a flap that goes over the leading edge of the frame and completely covers the apparatus.

When the retractable undercarriage has been lifted up and is inside the wing, the mechanism is automatically locked in position, but in order to prevent accidents the position of the undercarriage is shown on an indicator placed so that it is always in full view of the pilot. It is possible that in future models, electric hooters will be arranged to sound immediately the throttle is retarded in order to prevent the pilot from landing with his undercarriage up.

Some idea of the increase in efficiency that is obtained by using retracting apparatus may be gained from the fact that if the machine is flown with the undercarriage in the down position, its speed is reduced by 18 m.p.h.

The Merchandise Mart

Chicago Building that is a City in Itself

ONE of the most remarkable buildings in the world is that known as the Merchandise Mart, Chicago. This is not of record height, for it has only 18 storeys, with a comparatively small central tower mounting six storeys higher. It is built on such an immense area, however, that it is far larger than the towering Chicago skyscrapers near it, or the still taller structures, such as the Empire State and Chrysler Buildings, in New York, and is in fact the largest building in the world.

The Merchandise Mart cost over £4,000,000 to erect and its construction occupied 2½ years. The greatest length of the building is 724 ft. and its width is 236 ft. The plot of ground on which it stands is 93 acres in extent and it has a total floor space of well over 4,000,000 sq. ft., each floor having an area greater than the floor space available in the average 10-storey Chicago building. No less than 204 tons of coal are required every day to heat the rooms of the immense structure.



The river frontage of the Merchandise Mart, Chicago. The illustrations to this article are reproduced by courtesy of Messrs. Graham, Anderson, Probst and White, architects for the building.

This great building stands on the north bank of the Chicago River, which separates its position from a crowded area in which are situated most of the city's skyscrapers, business offices, great stores and hotels. It has a frontage of 573 ft. to the river, widening out to its full length of 724 ft. on the main frontage on Kinzie Street, which is parallel to the course of the river. It is therefore in an open position and is splendidly proportioned. Its size is only fully realised when it is compared with the buildings surrounding it, for these are dwarfed by its immense bulk, or with the passenger and freight vessels in the river, or the motor cars parked on the immense terrace on its river front. Even these comparisons do not enable its huge capacity to be grasped. A better idea can perhaps be obtained by imagining a super office building 59 storeys in height, erected on the playing area of an average Association football field, for the floor space in such a building would be nearly equal to that of the Merchandise Mart, which has only 18 storeys.

The Merchandise Mart has been built of reinforced concrete, the usual form of construction employed in American skyscrapers and other large modern buildings. It was necessary to sink caissons into the soil in order to provide a firm foundation, and 458 of these were used, or twice as many as had previously been employed in the erection of any building. These caissons were sunk 100 ft. below street level. No less than 50,000 cu. yds. of concrete were required in making them and the quantity used would cover the site of the building to a depth of nearly 2 ft. The steel frame was erected on this foundation and as the columns mounted skyward they were covered with reinforced concrete. The outside of the building is finished in Indiana limestone.

The total weight of steel in the Merchandise Mart is 45,000 tons and almost 4,000,000 cu. ft. of concrete were used in its erection. An interesting detail that illustrates the immensity of the structure is the inclusion of 9,000,000 sq. ft. of steel wire reinforcement in its floors, for this quantity of steel would cover a 100-mile length of a road 18 ft. in width. The quantity of stone in the building is 200,000 cu. ft. and there are also 20,000,000 bricks, 40 miles of lead piping and plumbing work, 32 miles of piping for steam heating and 5,000,000 ft. of timber. A sprinkler system has been installed as a protection against fire. This has no less than 40,000 sprinkler heads and the piping connecting the parts of the system has a total length of 142 miles. The building is lighted in the daytime by means of 4,000 windows with a total area of glass of 90,000 sq. ft., and at night 35,000 electric lamps are required. There are no fewer than 20,000 electric lighting fixtures.

The Merchandise Mart has had wide publicity as the largest building in the world, but it has greater claims to fame than mere size. It is a splendid example of modern business architecture and serves a practical and useful purpose. It was erected to provide manufacturers with means of displaying their merchandise to retailers and large buyers, and is remarkable for the wealth and variety of the manufactured

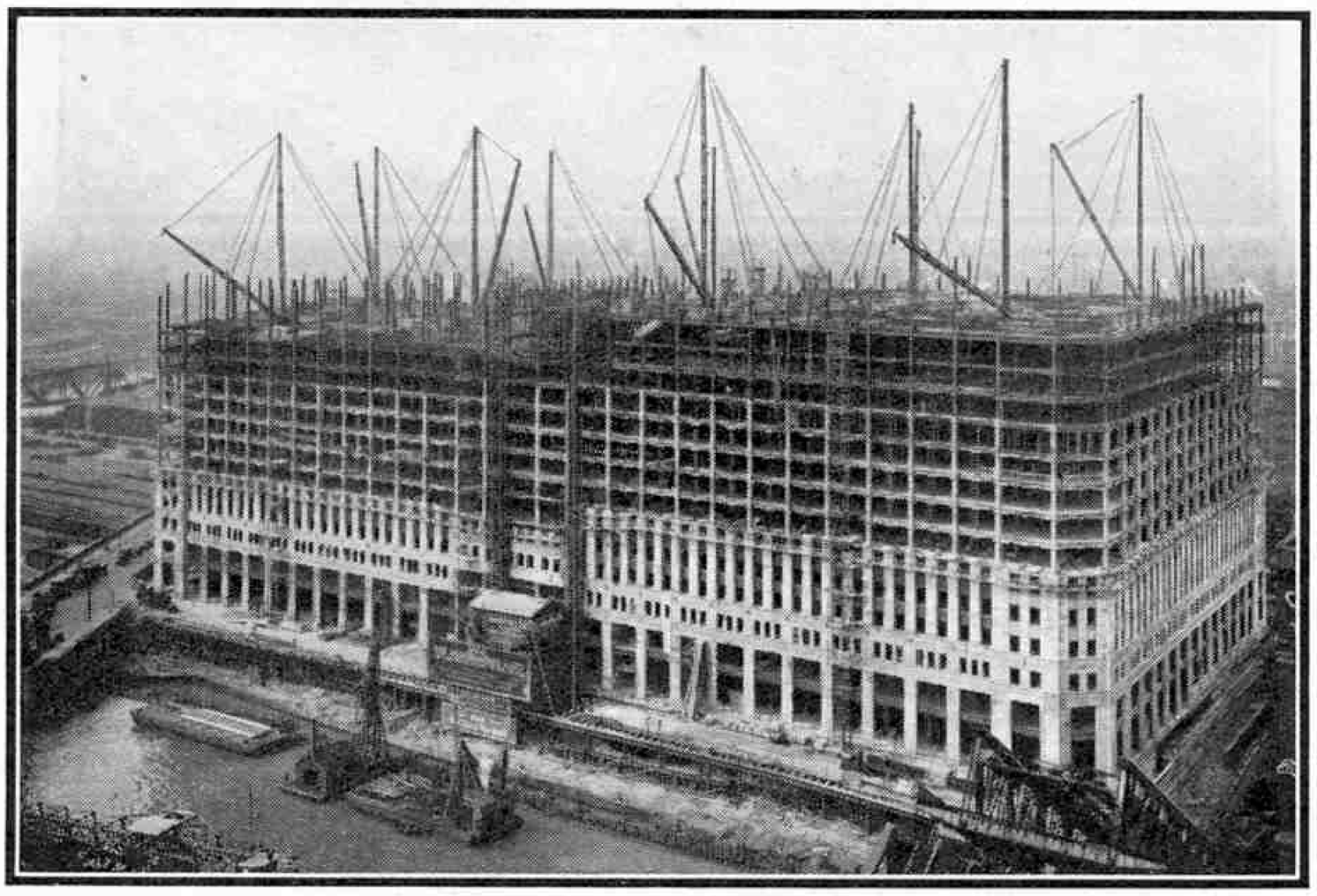
products displayed in it and for the ease and convenience with which these can be inspected by all interested in them.

There are 600 tenants in the building, and the total number of workers employed in it is 15,000. Quick transport from one floor to another is provided by 17 lifts, which travel 400 miles in a day, and in that time carry an average of 40,000 persons. During working hours the great building is indeed a city in itself, and the scale on which it is planned is shown by the inclusion in it of restaurants, capable of feeding 10,000 people daily, that have been established for the convenience of workers and visitors.



Preliminary work on the site of the Merchandise Mart, which is built on a foundation of 458 caissons sunk to a depth of 100 ft. below street level. The railway tracks now under the building can be seen in the background.

The building is almost unique for a great structure in a very large city in having a railway goods station actually on the premises. Underneath the Mart are private tracks more than 400 yds. in length connected with the Chicago and North Western Railroad. Wagons from any railway entering Chicago can be switched on to these tracks and thus delivered free of special charges direct to the Merchandise Mart. There they are unloaded into gigantic goods lifts in which the merchandise they bring is carried up to the floor on which its owners have showrooms. These elevators have a single trip capacity of nearly 53 tons.



Steel erectors at work on the upper storeys during construction, while concreting is in progress lower down. The raised spans of a lift bridge across the Chicago River can be seen on the right.

Nearly 5,000 different lines of goods are to be seen in the showrooms of the Merchandise Mart. Each line is displayed in its most suitable setting and can be closely inspected by purchasers at leisure and in comfortable surroundings. Great care has been taken to provide all the services that are required in transacting business. The Merchandise Mart itself is easily reached by rail, for on its second floor is a station with direct connection to the elevated railways that encircle Chicago's business centre, and also to the Chicago-Milwaukee Electric line. It is easily reached by road and a wide terrace on the river front of the building provides a free parking space supervised and guarded by attendants. Lounges, an information bureau, reading and writing rooms also are available and visitors can even command the services of capable secretaries and typists. The building includes its own post office, in which a very heavy volume of parcels is handled, a bank, a large drug store and three complete restaurants with a total seating capacity of 1,200 in addition to a grill room, a cafeteria and even a beauty parlour.

The rooms occupied by the tenants range from small offices with only one line on show to large establishments occupying several floors. All spaces in the Mart are completely enclosed and have double glass doors and corridor display windows. Altogether there are five miles of corridors within the building and more than $6\frac{1}{2}$ miles of plate glass is to be seen on these. Excellent use is made of the opportunities afforded for making good displays, and one manufacturer has even constructed a long aisle of window displays, giving the effect of a village street of the early sixteenth century, in order to show his goods in what he considers to be an appropriate setting. Above the old-fashioned round fronted display windows in this remarkable show room are smaller ones indicating the living quarters of the village shopkeepers, and although the floor is of synthetic marble it has been laid down to represent a cobbled pavement.

On the Footplate of a "Night Goods"

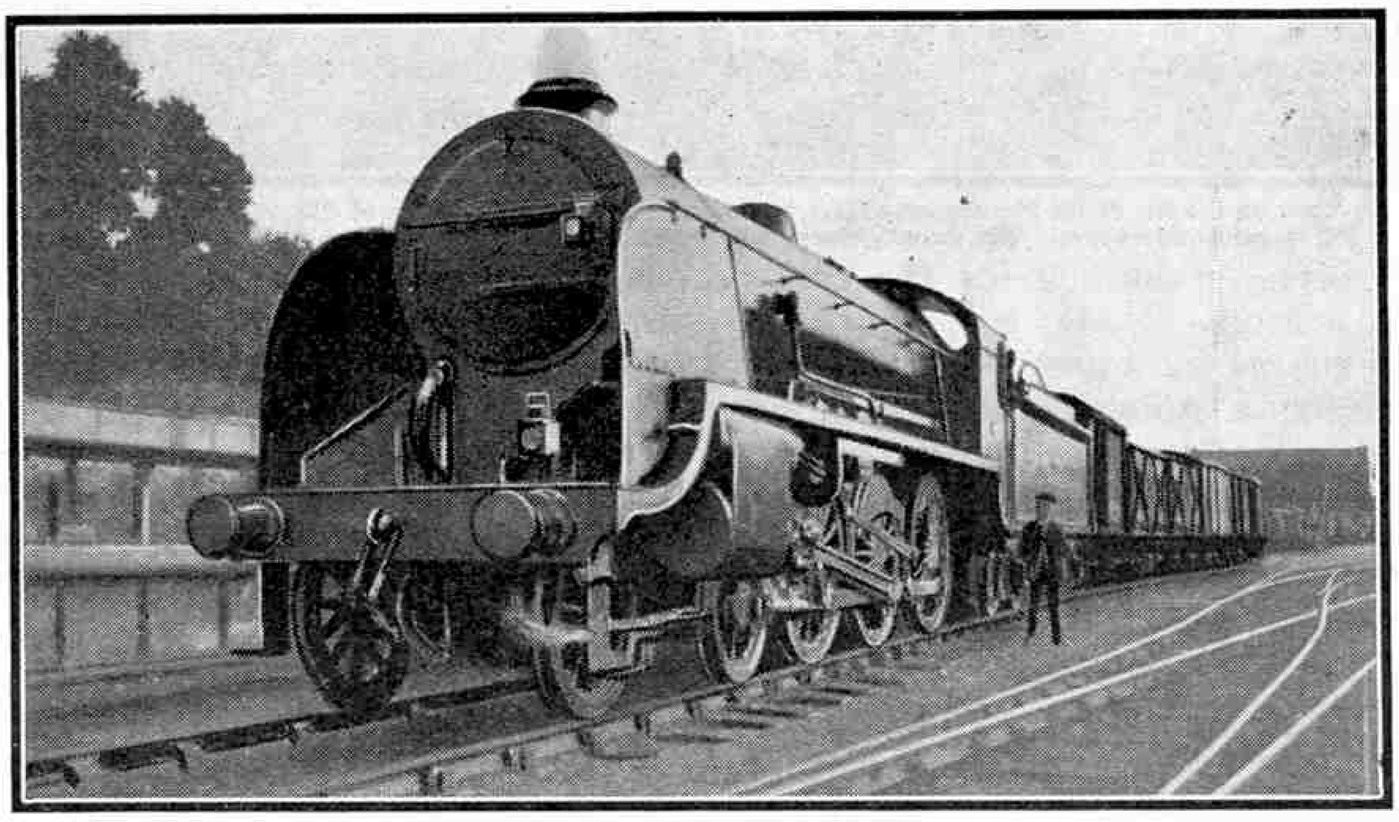
From Exeter to Nine Elms

By a Railway Engineer

DURING the last few years some notable speeding-up of express goods trains has taken place on all the British railways. Many trains conveying perishable freight, and composed entirely of wagons fitted with continuous brakes, are timed at speeds of 35 to 45 m.p.h. for the whole of their journeys. A run of 150 to 200 miles with such trains involves some really fine locomotive work.

A good example of these high-speed freight trains is the Southern Railway 7.38 p.m. from Exeter to London, which covers the 170 miles in 5 hours, inclusive of two stops totalling 13 minutes. I was recently privileged to ride on the footplate of this express for the whole journey, and a deeply interesting run it was.

From Exeter our load was not very heavy, 16 four-wheeled vans and a bogie brake van, a total weight of about 200 tons. The engine was one of the fine Class "A" 4–6–0s, which are almost identical with the "King Arthur" express engines except that they have smaller coupled wheels of 5 ft. 7 in. diameter. The actual engine was No. 826, in charge of Driver Hayman and Fireman Spray of Exmouth Junction shed.



At the start of the run. The S.R. Locomotive "No. 826" is a mixed traffic 4-6-0 of Class "A," which closely resembles the passenger "King Arthurs."

We got away in fine style, in fact the engine accelerated so rapidly down the falling gradient from Exeter that at Broad Clyst, less than five miles from the start, we were doing 65 m.p.h. with a goods train! The engine was working on 20 per cent. cut off and the regulator was only two-fifths open, and even on such easy steam as this was so master of the load that the same working was sufficient to take the train up the long climb to Honiton tunnel. Even on the last stretch where the gradient is 1 in 90 the speed did not fall below 23 m.p.h.

From the summit to our first stop at Templecombe very easy running was needed to keep time. On this stretch I was astonished at the freedom with which the engine steamed. We were maintaining an average of 40 m.p.h. over a very hilly road, and yet often we would travel for 8 or 10 miles without the fire being touched, and then only two or three shovelfuls were put on. The riding of the engine was very smooth, and even at 50 or 60 m.p.h. I was able to walk about on the footplate in comfort. So we reached Templecombe 59½ miles from Exeter in 102 minutes—four minutes early.

Here the load was increased to 43 vans which, with the bogie brake van, weighed about 500 tons. After a stop of 18 minutes we got away in tremendous style. On 35 per cent. cut off and the regulator nearly three-quarters open, "No. 826" accelerated just like an express engine. Two miles from the start we were doing 48; then came a sharp rise of two miles at 1 in 100 where we fell to 31; descending to Gillingham we reached 52, and then at the top of the four mile rise to Semley, again at 1 in 100, our speed was 25 m.p.h. The following comparison with the speed of an express passenger train over this stretch shows what splendid work this was. On my last journey with that most famous of Southern trains, the *"Atlantic Coast Express*, No. 768, *"Sir Balin,"* a "King Arthur," with a load of 445 tons, passed Gillingham at 65 and fell to 35 at Semley; that is during the four-mile climb the speed of the express fell 30 m.p.h., while that of the goods fell only 27.

A freight train takes a good deal more pulling than a passenger train because the friction is much greater. For an equal weight a goods train has nearly twice as many axles; the wagons do not travel so easily, they sway about, and all this increases the drag on the engine.

Once over Semley summit, the driver brought the cut off back to 20 per cent. again and the regulator was moved to about a quarter open. We kept up a steady 45 to 50 m.p.h. all the way down to Salisbury. It was now after 10 o'clock and nearly dark. In the twilight of a perfect summer evening it was most difficult to pick out the green signal lights, for they harmonised strangely with the blue-green of the woods and cuttings. After a careful slowing round the sharp curve at Wilton we reached Salisbury, 28½ miles from Templecombe, in 47 minutes, exactly to time.

Here "No. 826" came off and was replaced by "No. 778," *"Sir Pelleas"* of the "King Arthur" class, in charge of Driver G. Gray and Fireman Barton of Nine Elms shed. The driver greeted me with: "Have you got springs in your boots ?" We had not travelled far before I knew what he meant! This engine was due for the shops and was riding very roughly. Nevertheless a splendid run was made. Up the steep rise over the eastern ridge of Salisbury plain, on 30 per cent. cut off, *"Sir Pelleas"* gradually accelerated until we passed

Grateley summit at 35 m.p.h., 11 miles from Salisbury in 27½ minutes.

This engine, like "No. 826," was steaming very freely. The fire-box door was kept open the whole way, which was fortunate for me as I was able to read my watches easily in the light of the fire.



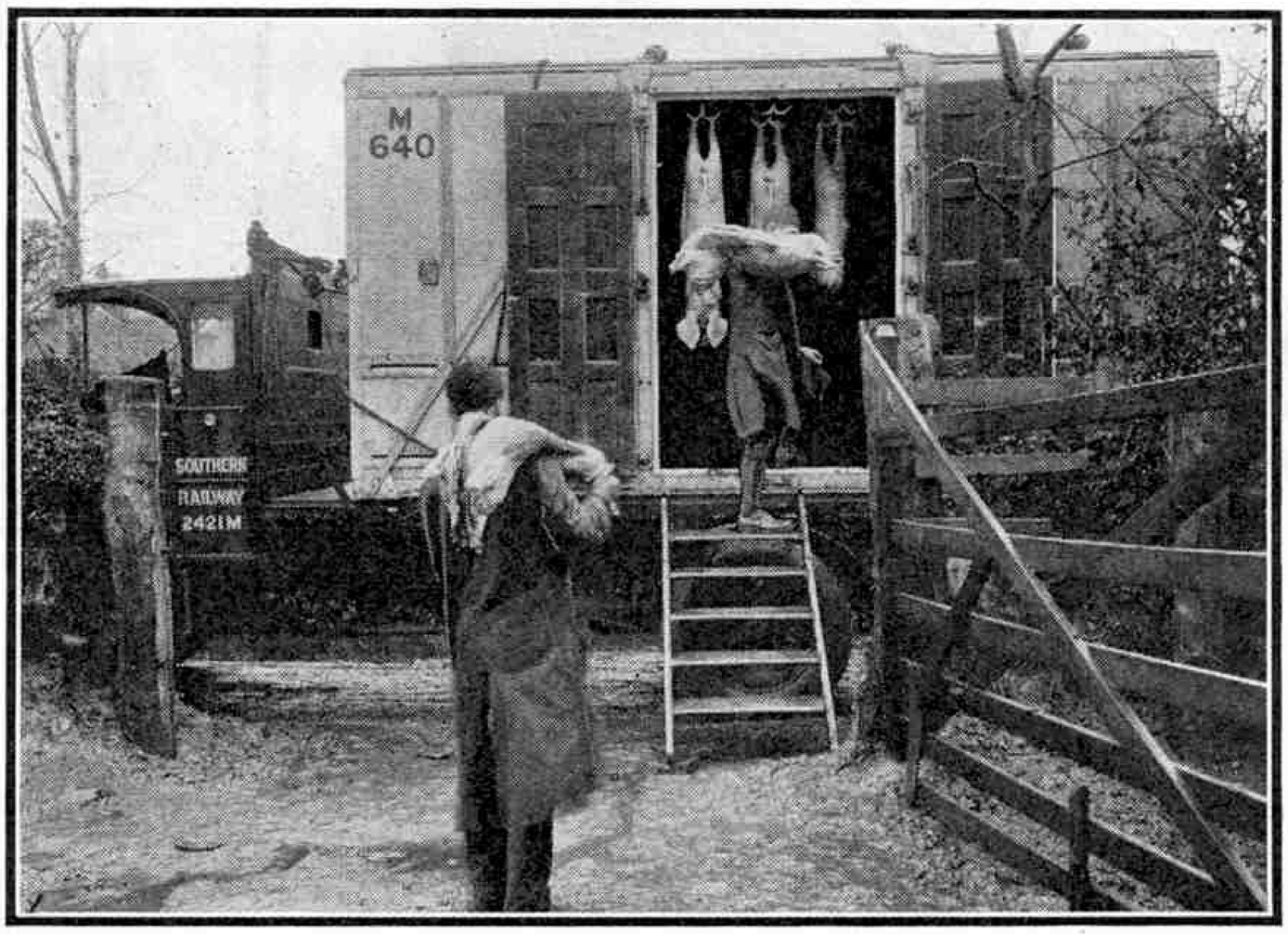
A view of part of Nine Elms Yard, where the journey described in this article terminated. This is the chief S.R. depot in London for freight traffic to and from the West Country.

Down the steep descent to Andover speed rose rapidly and the racket now became terrific. It was not a case of rolling or swaying, but a high-pitched, sustained rattle. We had just reached 60 when on went the brakes in readiness for a bad permanent way slack through Andover. For about a mile we crawled along at about 10 m.p.h., and then more steep climbing ahead. On 25 per cent. cut off, and with the regulator nearly full open, we regained speed steadily. Barton gave the fire a good stirring up with the pricker and we were soon doing 40 m.p.h. again. Up the gradual rise to Oakley this rate was sustained, and then, on breasting the summit, there began a spell of really fast running.

At Worting Junction the speed was 50 m.p.h., and three minutes later we flew through Basingstoke. To roar across the maze of points and crossings, with shunting going on on both sides of the line, and then to sweep through the big station at 55 m.p.h. in the dead of night, was a truly thrilling experience. We were doing 60 just afterwards, and kept up an average of 46 for the next 30 miles. I had become thoroughly used to the racket by now, and the speed was most exhilarating. It was a brilliantly clear moonlight night; one could see great distances across the country, and the wooded hills around Farnborough and Pirbright looked especially lovely. After passing Woking the fire was being very gradually let down, we were nearing home.

Approaching Wimbledon, for the first time in the whole journey, we got signals badly on, in fact we were nearly stopped; but the signal cleared just in time. The fire was quite low now, and it was interesting to study the inside of the fire-box. The underside of the brick arch was covered with incrusted matter hanging down like innumerable stalactites from the roof of a cave, all gleaming white hot. When steam was put on again, the draught at each "puff" made hundreds of red hot embers jump up from the floor of the grate; it was quite a fascinating sight.

Soon we were running through Clapham Junction, and then we were switched off the main line into Nine Elms yard. The finish was one of the strangest features of the journey. To draw up in the dark loneliness of a goods yard, with only one or two shunters with hand lamps to welcome us, seemed a curious end to a fast run compared with the animated scene on the arrival of an express at a big terminus.



Loading meat into an S.R. insulated container at a West Country farm. Despatched in the afternoon, it is delivered in London early next morning. This and the upper illustration on this page are reproduced by courtesy of the Southern Railway.

In about 10 minutes a path was clear for us to back out on to the main line again. There was a short wait for the signal, and then we steamed cautiously round into Nine Elms shed and the night's work was done. "*Sir Pelleas*" had run the 82 miles from Salisbury to Nine Elms in 147½ minutes, but the net time allowing for delays was only 130 minutes, an average of 38 m.p.h.

So much for the locomotive side of the journey. In the meantime what has become of the train that we brought up from the West? This has been seized upon by the yard staff and rapidly unloaded in order to rush the meat, fruit, vegetables and foodstuffs generally that composed our freight to the early morning markets. If we had had the opportunity, an examination of the load would indeed have been interesting. Probably it would have included sheep and pigs—carcases to-day, hanging in rows in railway vans or containers, but

(*Continued on page 42*)



Locomotive Performance on L.M.S.R.

Improved 4–6–0 "Baby Scot" locomotives with tapered boilers are still being built at Crewe, and Nos. 5627 to 5632 have now been added to those previously noted. When the series has been completed, ending with No. 5654, a batch of 25 of the new standard two-cylinder mixed traffic 4–6–0 engines will be put in hand.

Excellent locomotive performances continue to be recorded of both the original 5X "Baby Scot" locomotives with parallel-sided boilers, and those with the new tapered boilers. On the very tight Midland Division timing of 42 min. over the 41.8 miles from Luton to Kettering, start-to-stop, a splendid run was made recently by No. 5542, in charge of Driver Woodley, of Kentish Town, on the 8.25 a.m. from St. Pancras. The load, 287 tons tare, was slightly heavier than usual, but the 41.8 miles were covered in 40 min. 32 sec. at an average start-to-stop speed of almost 62 m.p.h., a gain of 1½ min. on schedule. The initial 19.6 miles from Luton to passing Bedford were run in 18 min. 40 sec., a maximum of 83.3 m.p.h. being sustained for 1½ miles beyond Ampthill. The minimum at Sharnbrook summit was 43 m.p.h. and the engine was eased after a maximum of 73½ m.p.h. had been attained on the subsequent descent.

On the London-Birmingham two-hour services equally fine work is being done. With engine No. 5552, the precursor of the tapered boiler series, and a load of 8 vehicles, 260 tons tare, Driver Grazier, of Bushbury, on the 2.35 p.m. ex Birmingham ran from Birmingham to Coventry, 18.9 miles in 19 min. 26 sec., with a maximum of 76 m.p.h. at Canley Gates. Two minutes were lost to Rugby by the p.w. slack now in operation at Brandon ballast pit, but after passing Rugby some very smart work was done, the 47.3 miles from Coventry to passing Bletchley being covered in 46¾ min., with speeds of 58.4 m.p.h. at Kilsby summit, 75 m.p.h. on Buckby bank, 63½ m.p.h. minimum at Roade summit, and 79 m.p.h. at Castlethorpe. Despite the Brandon slack and a signal check at Bushey to 30 m.p.h., the train arrived at Euston exactly on time.

With the 10.15 a.m. ex Birmingham, 253 tons tare, Driver Turner (Bushbury) ran from Northampton to Euston, 65.8 miles, in 68 min. 40 sec., a gain of 5½ min. on schedule, the start having been behind time. Maxima were 73 m.p.h. at Castlethorpe and 77½ m.p.h. at Nash Mills, with an intervening minimum of 56 m.p.h. at Tring. "Even time," or the equivalent of a rate of 60 m.p.h. from the start, was attained by Harrow, after which the engine was eased as the train was now on time. We are indebted to Mr. D. S. Barrie for the foregoing timings.



An L.N.E.R. up Harrogate express. The locomotive is No. 4471, "Sir Frederick Banbury," the second of the famous Gresley "Pacifics" to be built. Photograph by Real Photographs Co., Liverpool.

G.W.R. Locomotive Withdrawals

Eleven more of the 2–6–0 "Aberdare" class freight engines have been withdrawn for scrapping; their numbers are: 2605, 2606, 2609, 2611, 2617, 2621, 2627, 2630, 2641, 2646, 2666. Three further 4–6–0 express engines also have finished their course. They are: No. 2917, *"Saint Bernard"*; No. 2923, *"Saint George"*; and No. 4027, *"Norwegian Monarch."*

"M.M." Reader to Broadcast Railway Talk

A railway talk to be broadcast in the Scottish Regional programme at 5.15 p.m. on Tuesday, 22nd January, will be given by Mr. C. M. Furst, who is a keen reader of the *"M.M."* and a member of the Hornby Railway Company. It will form part of the Children's Hour, and railway gramophone records included in the programme will add greatly to its interest for railway enthusiasts.

Speeding Up the Paris-Brussels Expresses

Great improvements have been made recently to the main line track in Belgium with the result that it has been possible to speed-up the important express services between Paris and Brussels. The accelerated schedules now in force make those services the fastest operating between any two capital cities in the world. There are five through trains in each direction and their average speed is 58½ m.p.h. The fastest run of all is made by the *"Blue Bird"* Pullman train that takes only 183 min. for 193.1 miles from Brussels to Paris, requiring an average speed of 63.3 m.p.h., start to stop. In the reverse direction the same train is allowed 190 min. for the non-stop run, being a minute more than the schedule of the northbound *"North Star"* Pullman express.

Even faster average speeds are made by some of the expresses that make calls en route and in two cases the 95.1 miles from Paris to St. Quentin are covered in 88 min., demanding an average of 64¾ m.p.h. All these services between Paris and Brussels are worked throughout by locomotives belonging to the Northern Railway of France, or the "Nord," as it is often familiarly known.

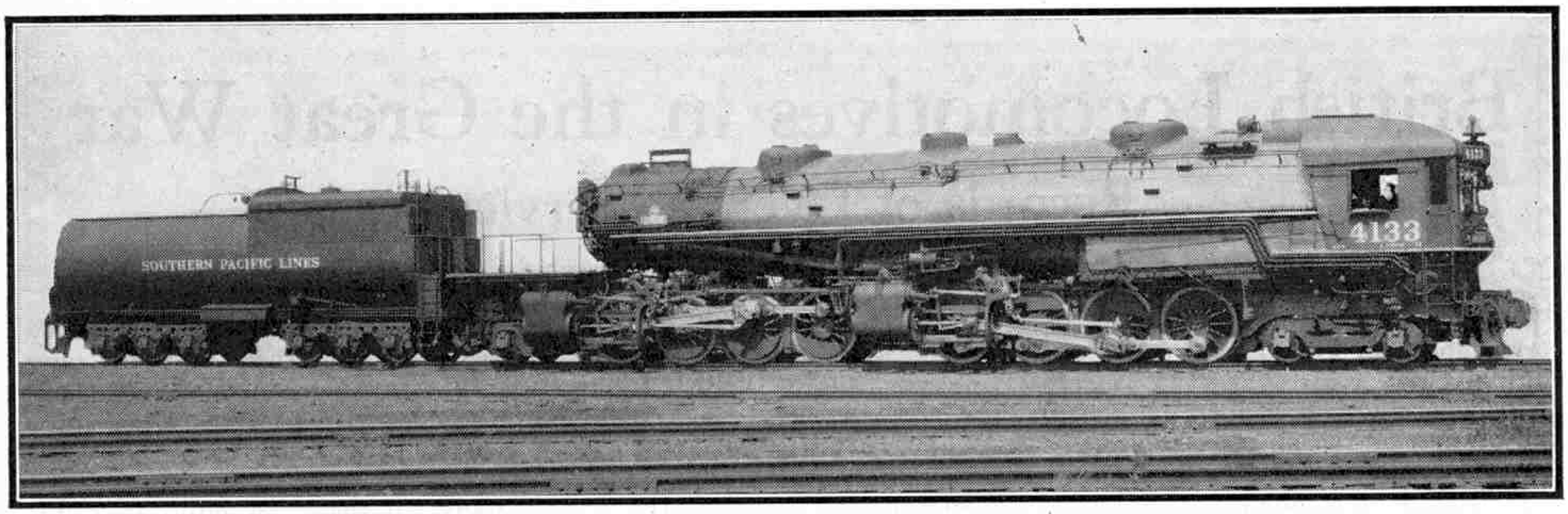
L.N.E.R. Locomotive News

The 2–8–2 "Mikado" locomotive No. 2001, *"Cock o' the North,"* went to France on 5th December for thorough testing on the splendidly equipped experimental plant at Vitry, near Paris. The sea-crossing was made by the train-ferry from Harwich to Zeebrugge.

Four new 2–6–0 engines of the K3 class, built by Armstrong Whitworth & Co. Ltd. Nos. 2934 to 2937 are now in traffic.

At Darlington works a new lot of 0–6–0 freight engines of the J39 class are in hand, and the first five will have the numbers 1475 to 1479.

Five more three-cylinder 4–6–0 locomotives of the "Sandringham" class are to be built at Darlington. They will be given the following numbers and names: 2843, *"Champion Lodge"*; 2844, *"Earlham Hall"*; 2845, *"Gilwell Park"*; 2846, *"Helmingham Hall"*; and 2847, *"Kimberley House."*



Famous G.W.R. Engine Driver Retires

One of the best known G.W.R. express drivers, Mr. T. Lewis, of Old Oak Common shed, London, retired from service early in December. He had gained an enviable reputation as a skilful engineman who could be depended upon to keep remarkably exact time. He was at the regulator of the "*Montgomery Castle*" at the head of the "*Cheltenham Flyer*" on 12th September, 1932, when that famous train first ran to its present schedule of 65 min. for the 77¼ miles from Swindon to Paddington, and on that occasion actually made the run in 61 min. 8 sec.

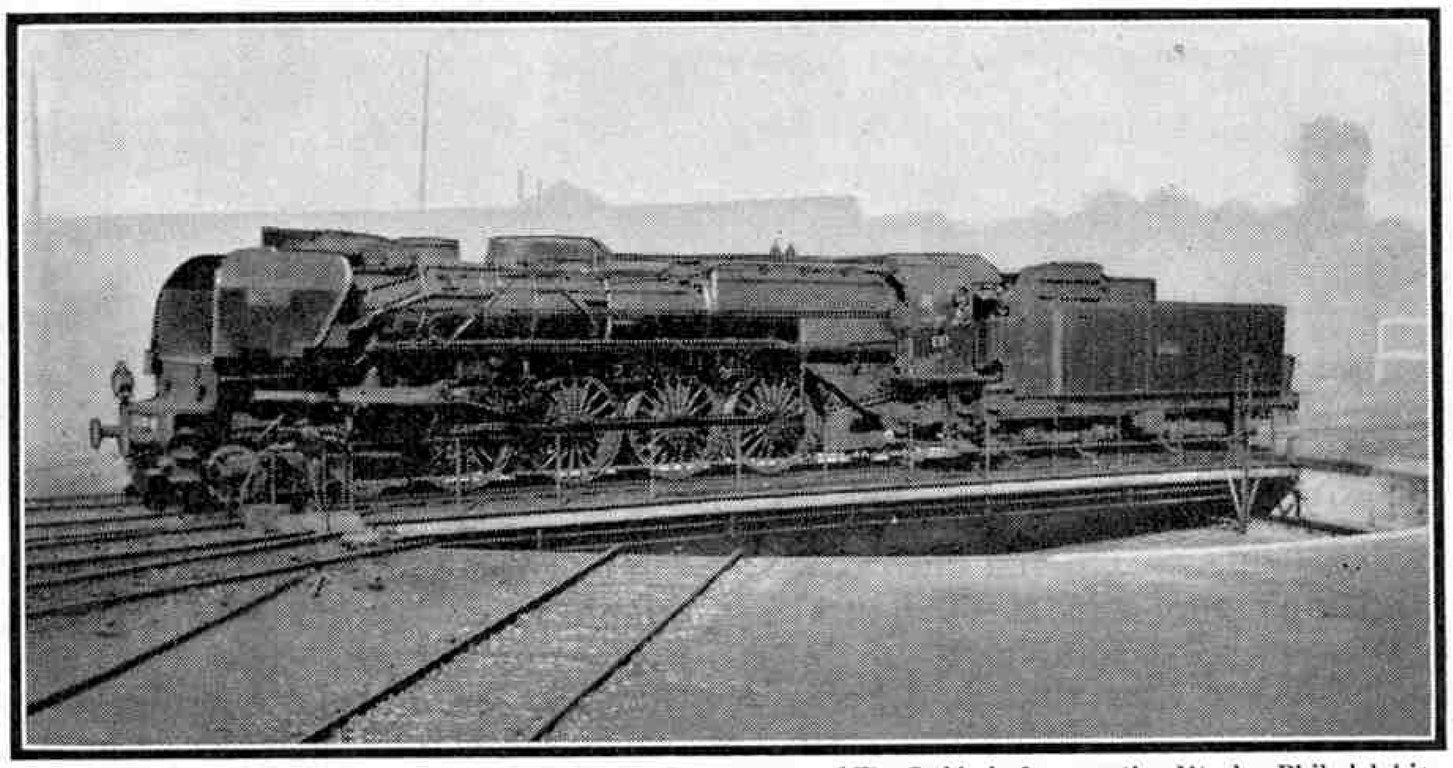
Driver Lewis made his last run with the "*Flyer*" on Tuesday, 27th November, and among those who specially travelled on the train were "Observer" of the "*M.M.*," Mr. Cecil J. Allen, and Mrs. Lewis, the wife of the driver. It was a typical Lewis run. The engine was one of the oldest "Castles," No. 4078, "*Pembroke Castle*," and not at all in fresh condition. The train consisted of eight coaches, weighing with passengers and luggage 265 tons. By Uffington (10.8 miles) a speed of 80 m.p.h. had been attained and a maximum of 83½ m.p.h. was reached at Steventon. Didcot (24.2 miles) was passed on the stroke of schedule time in 21 min. At Pangbourne speed had dropped to 77½ m.p.h. but rose again to 80.3 m.p.h. before Reading which was passed 11 sec. early. At Southall the train was 12 sec. before schedule, and within an hour of leaving Swindon 75 miles had been covered. Following a very steady approach to Paddington and a mere crawl along the platform, the train came to a standstill just 1 min. early, having taken exactly 64 min. from Swindon.

When working the "*Flyer*" on 18th October last, with No. 5001, "*Llandovery Castle*," and seven coaches, Driver Lewis made the run in 64 min. 15 sec. in spite of a severe check at Goring. During the run, a distance of 41 miles was covered in 29 min. 1 sec., giving an average speed of 84.8 m.p.h.

The many friends of Driver Lewis wish him a long and happy life in his retirement.

Railways and the Royal Wedding

The wedding of the Duke of Kent and Princess Marina on Thursday, 29th November last, brought an appreciable increase of traffic to the railways, a large number of special trains being run to accommodate the thousands of people who visited London for that great occasion. Probably the longest-distance excursion was one run by the L.M.S.R. from Brechin in Scotland, 496 miles from London, and thus entailing almost 1,000 miles for the double journey. Sleeping car accommodation was provided.



At the head of the page is a photograph, reproduced by courtesy of The Baldwin Locomotive Works, Philadelphia, of an oil-burning articulated locomotive of the Southern Pacific Railroad, which is arranged to run with the cab leading. Our lower illustration shows a French 4-8-2 "Mountain" express locomotive of the Est system, with smoke deflectors and other fittings, on the turntable. Photograph by René Pascaud, Chaumont.

To the G.W.R. fell the privilege of providing the special honeymoon train for the Duke and Duchess after their marriage. It was made up of five modern coaches including the very handsome and luxurious saloon "*King George*," in which the royal pair travelled. At the head of the train was the famous 4–6–0 locomotive—"*King George V.*"

The departure was made from No. 1 Platform at Paddington, which had been gaily decorated. The destination of the train was Birmingham and the run was accomplished non-stop in 1 hr. 55 min.

The Channel Train-Ferry

The necessary works are being pushed forward at Dover and Dunkirk in preparation for the opening of the new train-ferry in the coming summer. Two of the special vessels ordered for this service have already been finished and delivered to the Southern Railway. They are the "*Twickenham Ferry*" and the "*Hampton Ferry.*"

Leeds Station to be Re-Signalled

The L.N.E.R. and L.M.S.R. have placed a contract with the Westinghouse Brake and Saxby Signal Co. Ltd., for the complete re-signalling of Leeds New Joint Station. A new signal box will be built at the West end of the Station to replace the existing West, Canal and Station signal boxes. The new box will operate by power all the points at present worked from these three boxes, and colour light signalling, together with complete track circuiting, will be installed. The whole of the train movements will be shown on the combined illuminated diagram and control panel, on which will be incorporated the whole of the small thumb switches required for controlling the points and signals.

At the East end of the Station the existing signal box will be retained, but the number of levers working points and signals will be greatly reduced. The points will be mechanically operated as at present, but the existing signals will be replaced by colour light signals together with complete track circuiting. An illuminated diagram also will be provided.

Reduced Return Fares Now Permanent

As a sequel to the success of "Summer Tickets" at a penny a mile for the return journey, the British railways have decided to make these facilities permanent from 1st January. The tickets will for the future be known as "Monthly Returns." First-class fares also have been reduced, and in the case of "monthly returns" are now 1½d. per mile. These monthly return tickets are available for use on the outward and return journeys on any day within a month of issue. There is to be a great speeding-up of the railway services in the spring and a very attractive programme of cheap excursions is also being prepared.

* * * *

The L.M.S.R. announce that 10,833 new passenger and goods vehicles will be provided under the programme to be undertaken this year. Most of these vehicles will be constructed in the L.M.S.R. workshops at Derby and Wolverton.

British Locomotives in the Great War

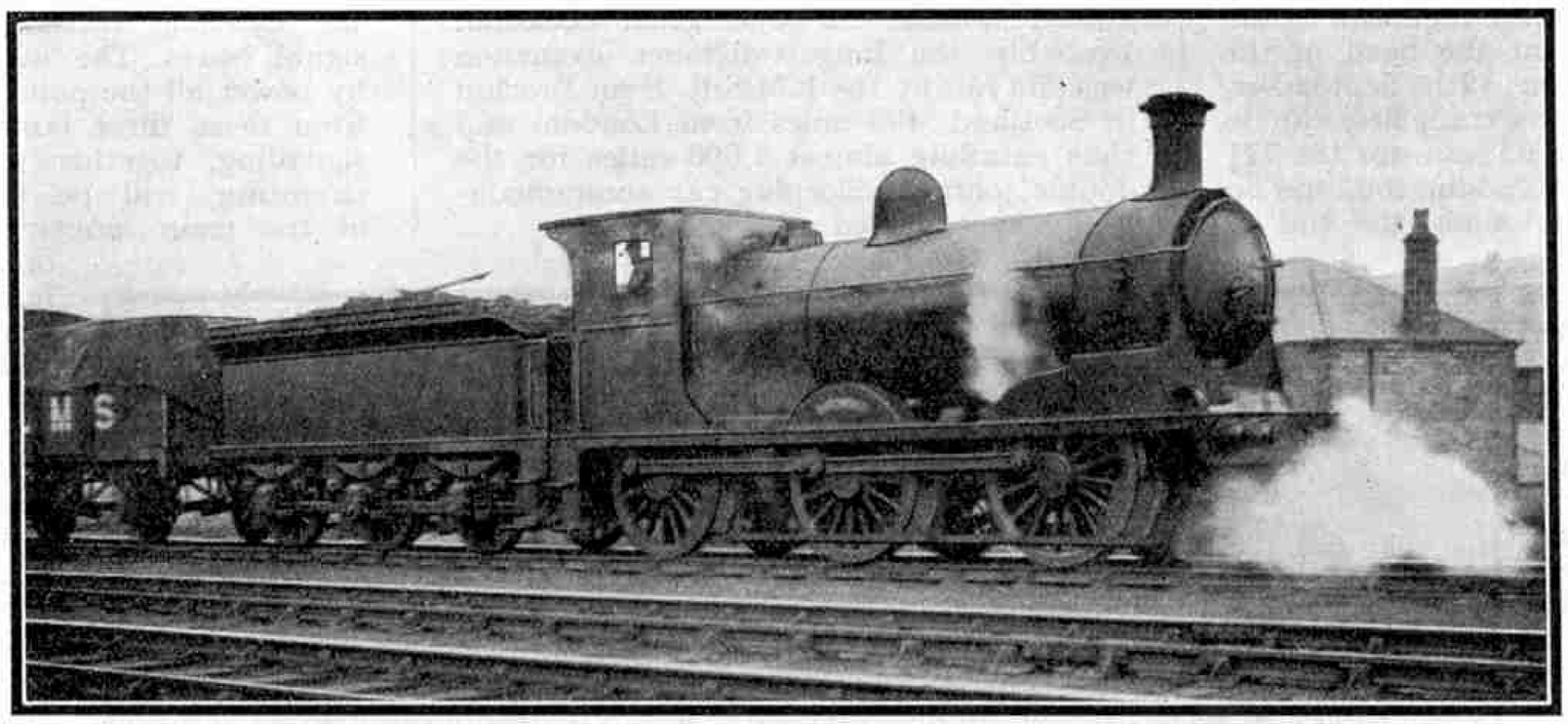
Records of Overseas Service

THERE are still in service on British railways large numbers of locomotives that did valuable work during the Great War. In a sense, indeed, all British locomotives helped in the struggle, for the railways, under the supervision of the Railway Executive Committee, were under Government control, and operations were conducted according to national needs. The greatest interest of course is attached to the locomotives that left the country for service overseas, but those that carried on at home deserve their share of praise. Many of the latter suffered severely as a result of the necessarily curtailed maintenance due to wartime conditions, and the frequent overloading that was practised, and have been withdrawn from service.

The most obvious form of wartime assistance provided by the railways was in connection with the transport of troops to southern ports for shipment across to France. On the outbreak of war some 350 special trains were run at 60 hours' notice, and the work was actually completed in 48 hours, which was 20 per cent. less time than had been estimated for by the Government authorities. In this work the former London and South Western Railway was concerned, as Southampton was the principal port of embarkation. This company carried out the operation of a large number of special trains for military purposes with comparatively little dislocation of the heavy holiday traffic, which was then at its height. For three weeks an average of 73 trains a day were dealt with, and as their operation was confined to 14 hours out of the 24, this meant that there was a special train every 12 minutes.

Another big railway task was the construction and equipment of ambulance trains for use in this country and abroad. Some of these trains consisted of vehicles specially built for the purpose, and others were made up of suitable vehicles that had been refitted for their new duties. These trains, with large red crosses displayed on a white ground on each vehicle, were unpleasantly familiar sights on our railways during the war years.

Owing to the disorganisation of the railway systems in Northern France, and the difficult conditions prevailing there at the time, it became necessary to send British railway material to assist in providing the necessary transport behind the lines. Thus there came to many British locomotives the strange chance of service on foreign soil. The locomotives for this work were selected for their haulage power rather than for their speed, and large numbers of that typical British goods type, the 0–6–0, went overseas. In addition eight-coupled locomotives were sent by the L.N.W.R., the G.C.R., and the N.E.R. A portion of the sand-box of one of these N.E.R. locomotives is illustrated on the next page, showing the chevrons and grenade that distinguished those that went on active service. The handy G.W.R. 2–6–0s, new engines of the "53" class built in 1917, were also represented overseas, as were also some of the familiar Brighton 0–6–2 tanks.



An L.N.E.R. 0–6–0 goods locomotive of class "J36." It received the name "Birdwood" on account of its war service in France, and now bears the number 9662. Photograph by Mr. R. Whitaker, Liverpool.

The North British Railway and the neighbouring Caledonian each contributed for overseas service tender engines of the 0–6–0 type, and the former company adopted a notable method of distinguishing their engines that went abroad. This took the form of allotting to the various engines the names of famous generals and of places associated with the campaign of the allied armies in France. This form of identification, like the North Eastern chevron scheme, still survives under the L.N.E.R. regime. For example, the North British 0–6–0 No. 9662, of the "J36" class, illustrated on this page, is named "*Birdwood*"; and its immediate predecessor, No. 9661, bears the familiar name "*Ole Bill.*" The sight of a name such as these on a humble Scottish goods engine peacefully engaged in shunting at some little wayside station comes as a reminder that there was a time when the engine played its part towards winning the Great War.

British locomotives were also to be found farther afield than in France. In the neighbourhood of Salonika there were some of the Great Western 0–6–0s, and L.S.W.R. engines of the same wheel arrangement were in service both there and in Palestine. After the War some of these L.S.W.R. engines were transferred to the Palestine Railways, extended smoke-boxes being fitted to burn the wood fuel in use there. Among other engines sent out East were 42 L.N.W.R. 0–6–0s of the class designed by Mr. Webb for coal traffic. Some of these had previously seen service in France, and were decidedly well worn before commencing their Eastern

duties. Eventually they were taken out of traffic as no longer fit for service, and were used in pairs as stop blocks at the ends of siding lines. We may be sure that Mr. Webb never contemplated any of his engines ending their days as buffer stops in a desert!

One of the Midland Railway 0–6–0s, No. 2717, now withdrawn, can claim to have had a decidedly unusual experience for a British locomotive. It had to be abandoned by the British forces, and for some months it remained, punctured by shell fire, between the opposing armies. Later it was captured by the Germans in a successful assault and repaired and set to work; but the Germans in turn were compelled to abandon it during their retreat in 1918, and it was then recovered by the British. In the following year the engine was demobilised and again took up work on the Midland Railway. To commemorate its remarkable adventures it bore a special brass plate giving particulars of its war service.

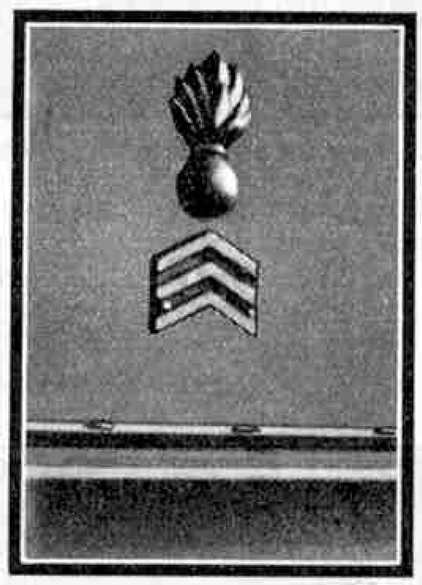


An 0–8–0 locomotive of the former North Eastern Railway photographed on active service. The lettering "R.O.D." on the tender signifies "Railway Operating Division."

A compliment was paid to the Great Central Railway in the selection by the Government as a suitable standard for war service of the 2–8–0 type locomotive designed by the company's Chief Mechanical Engineer, Mr. J. G. Robinson. Large numbers of these engines were ordered from various locomotive building firms for the use of the Railway Operating Division. This explains the frequent reference to the engines of this class as "R.O.D." or "M.M." engines, the latter initials signifying Ministry of Munitions. Certain modifications were carried out in order to render the design more suitable for its special purpose. These included the provision of the Westinghouse brake and screw couplings for working passenger trains. Two jacks were carried on the footplate in front of the smoke-box after the manner of many foreign and colonial locomotives, as the condition of the permanent way in France was distinctly uncertain with the possibility of shelling or bombing at any time.

Some of these engines never saw war service abroad as they were completed after the Armistice; and many of them have been disposed of among various railways. It is an interesting fact that some of them, after a period of storage, were reconditioned and sent out to China for use on the Shanghai-Hangchow-Ningpo Railway. Cowcatchers and central couplers were added to conform to local requirements, and new tenders were provided. Still others of the class are now to be found in service on a private colliery railway system in New South Wales.

In order to commemorate in a suitable manner the patriotism of their employees, many thousands of whom joined the Colours, several railways had appropriate names and inscriptions placed on certain locomotives. Thus the L.N.W.R. "Claughton" locomotive "*Patriot*" carries its name on a specially large plate that bears also the words: "In memory of the fallen L. & N.W.R. employees, 1914–1919." This engine was built in January, 1920, and the appropriate number 1914 was specially allotted to it. The G.C.R. engine "*Valour*" is also well known, and like the L.N.W.R. example is of the four-cylinder 4–6–0 type. Its splashers carry a special plate inscribed: "In memory of G.C.R. employees who gave their lives for their country, 1914–1918." Both these engines were of the largest express class developed by their respective companies, and in this they were paralleled by the L.B.S.C. 4–6–4 tank locomotive "*Remembrance*," now S.R. No. 2333. The side tanks of this engine bear a neat rectangular plate inscribed: "In grateful remembrance of the 532 men of the L.B. & S.C. Rly. who gave their lives for their country, 1914–1919."



The miniature grenade and chevrons carried by North Eastern locomotives, in recognition of their war service. Photograph by Mr. T. W. Burgess, Liverpool.

There are two colonial "war memorial" locomotives, one Indian and one New Zealand. The former is named "*Hero*" and belongs to the Great Indian Peninsular system. It is No. 411 in that company's books, and is of the handsome standard 4–6–0 express class. The New Zealand engine is of the standard 4–6–2 pattern of the New Zealand Government Railways and bears the name "*Paschendaele*," the scene of such bravery and courage on the part of the New Zealand troops.

In addition to the locomotives contributed by our railway companies, or built to their designs, there were many other engines acquired for service by the Government. There were some fine 4–6–4 tank engines built by Beyer Peacock & Co. Ltd., in 1914, and intended for the Dutch State Railway, where the original engines of this design had been put into service in the previous year. Of the 1914 lot of 34 the R.O.D. took over 14, and these were acquired by the French Nord system after the War. That company also took over 10 engines that had been built in this country for use on the Trans-Australian line, but which were diverted for R.O.D. purposes to France.

It is interesting, too, that the Nord took over a number of Canadian locomotives of the 2–8–0 type that had been built to the order of the Government; these have since been converted into 2–8–2 tank engines. The American Baldwin Locomotive Works constructed a large number of engines for the R.O.D., ranging from small narrow-gauge tank engines to large standard gauge 4–6–0 and 2–8–0 tender locomotives. All the 4–6–0s were acquired by the Belgian State Railways and the 2–8–0s largely taken over by the Nord. The Belgian State also took some of these 2–8–0s but these are now all scrapped.



A BOOK TO READ

BY THE EDITOR

"Southern Cross to Pole Star"

By A. F. Tschiffely

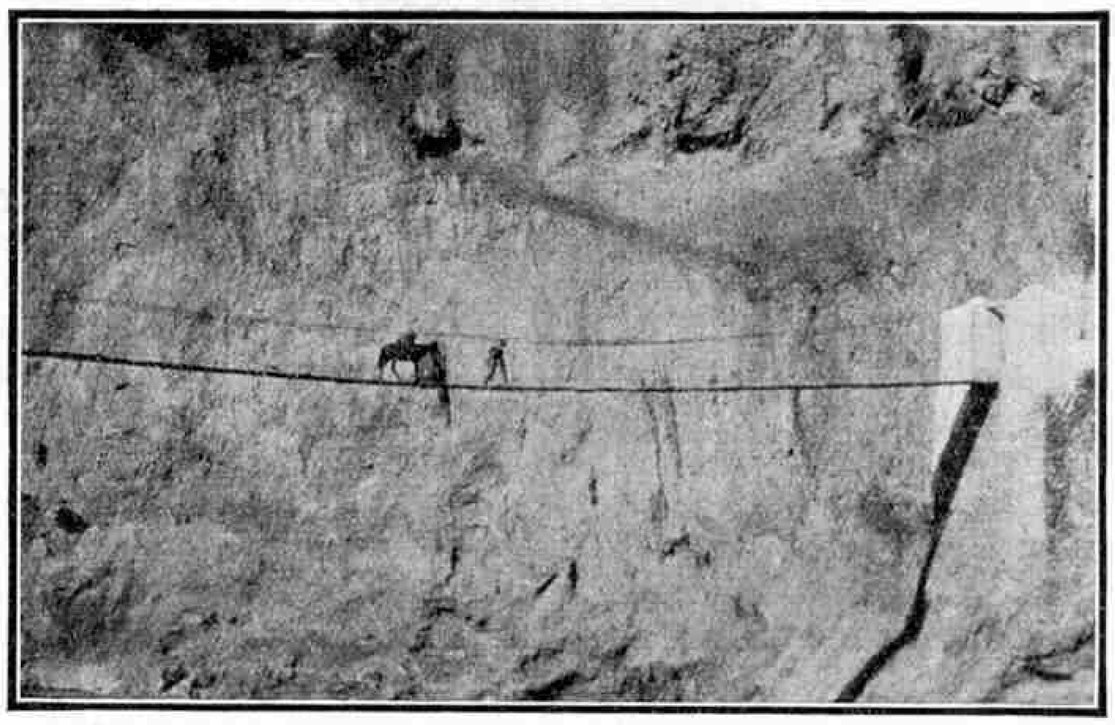
SINCE the Great War our attention has become increasingly focussed on mechanical means of transport, and the horse has quietly but rapidly slipped into the background. We have come to regard long journeys, apart from those by sea, as being the exclusive province of the motor car and the aeroplane, never giving a thought to the horse in this connection. It came as a complete and refreshing surprise, therefore, to hear of a 10,000-mile ride on horseback from the Argentine to the United States made by Mr. A. F. Tschiffely. The story of this ride, the most remarkable in history, is graphically told by Mr. Tschiffely in his book: "*Southern Cross to Pole Star.*"*

After spending some time teaching in England, Mr. Tschiffely went to the Argentine and for nine years was a master in the largest English-American school in the country. Towards the end of this period he began to feel that he was getting into a rut, and there came into his head the idea of this ride, which was not to be merely a great adventure but also was to provide a convincing demonstration of what he regarded as the unique stamina of the Creole horse. Finally he took the plunge and made preparations for the ride. He was provided by Dr. Emilio Solanet with two Creole horses, *Mancha* and *Gato*, that formerly had been the property of a Patagonian Indian chief. *Mancha*, then aged 16 years, was a red with heavy irregular splashes of white and white face and stockings, the type known in the United States and England as "pinto" or "piebald." *Gato*, 15 years old, was more or less of a copper colour. Their sturdy legs, short thick neck and Roman noses were "as far removed from the points of a first-class English hunter as the North Pole from South"; but the author had perfect confidence in their ability to make the journey. They were completely wild and were broken in only with difficulty; indeed they were far from tame when the ride began. Mr. Tschiffely rode the horses alternately, the spare animal carrying the pack.

Leaving Buenos Aires, the author set out across the 180 miles of dead flat country to Rosario, over roads that at the best were simply dirt-tracks, and in wet weather became a mass of mud. From Rosario he took a north-westerly course towards the Bolivian border, and for over 200 miles travelled through fertile but monotonous cattle and corn country. Nearing the desolate parts of Santiago del Estero the land became more and more arid. "A few more journeys and we were in the midst of the worst parts of the region where the horses raised thick clouds of fine dust, so dense at times that it was difficult to see the way, especially if a slight wind happened to be blowing from behind us. In some places the ground looked as if it were covered with snow, saltpetre giving it this strange effect."



Plodding along a jungle track. (From "Southern Cross to Pole Star" reviewed in this article.)



A slender bridge across a Peruvian chasm.

It was a relief to leave this region and enter the forest land. The first night in this "Argentine Eden" was spent at a farmhouse where the author heard an amusing and probably true account of how flea-infested foxes deal with their unwelcome guests. "Shortly before sunset Mr. Fox usually comes out of his burrow to see how things go outside, and to find out if the weather is suitable for a good night's hunting. If there is an "arroyo" (stream) near, he then goes down to wet his dry throat. Presently he slowly dips the lower part of his belly in the water and, by degrees, gently and very slowly, goes in deeper, until finally his back is covered. The hairs along his spine are bristled as if he were facing an enemy, and as the fleas have been forced higher and higher by the rising water they will finally take refuge on the bristles that are still out of the water. When the time comes the fox suddenly goes completely below the surface, and then immediately swims away, leaving most of the fleas to float on the water, where minnows and other small fish snatch them."

Steadily pursuing his way towards the border, the author entered the Andes and passed over wild and wind-swept mountains. Here he had his first real check. A thorn pierced one of his fingers and set up blood poisoning, and to make matters worse he began to suffer from mountain-sickness due to the high altitude. The poisoning spread and got rapidly worse, and he was in a very serious condition when one night in the lonely hut of a mountaineer he heard of an Indian herb doctor of great local fame. A messenger was sent, and after four days the old Indian arrived and set to work with his mysterious preparations. The treatment was effective, and five days later the author was able to resume his journey. It is interesting to know that although he suffered on several subsequent occasions from mountain-sickness, the horses did not seem to be in the least affected by the rarefied air. The border village, La Quiaca, roughly 1,300 miles from Buenos Aires, was reached after crossing the highest pass at Tres Cruces (Three Crosses), over 11,000 ft. above sea level, and here the author gave his horses a well-earned rest.

The next objective was La Paz, the capital of Bolivia, which involved riding through deep ravines and canyons, fording several dangerous rivers, and climbing steep

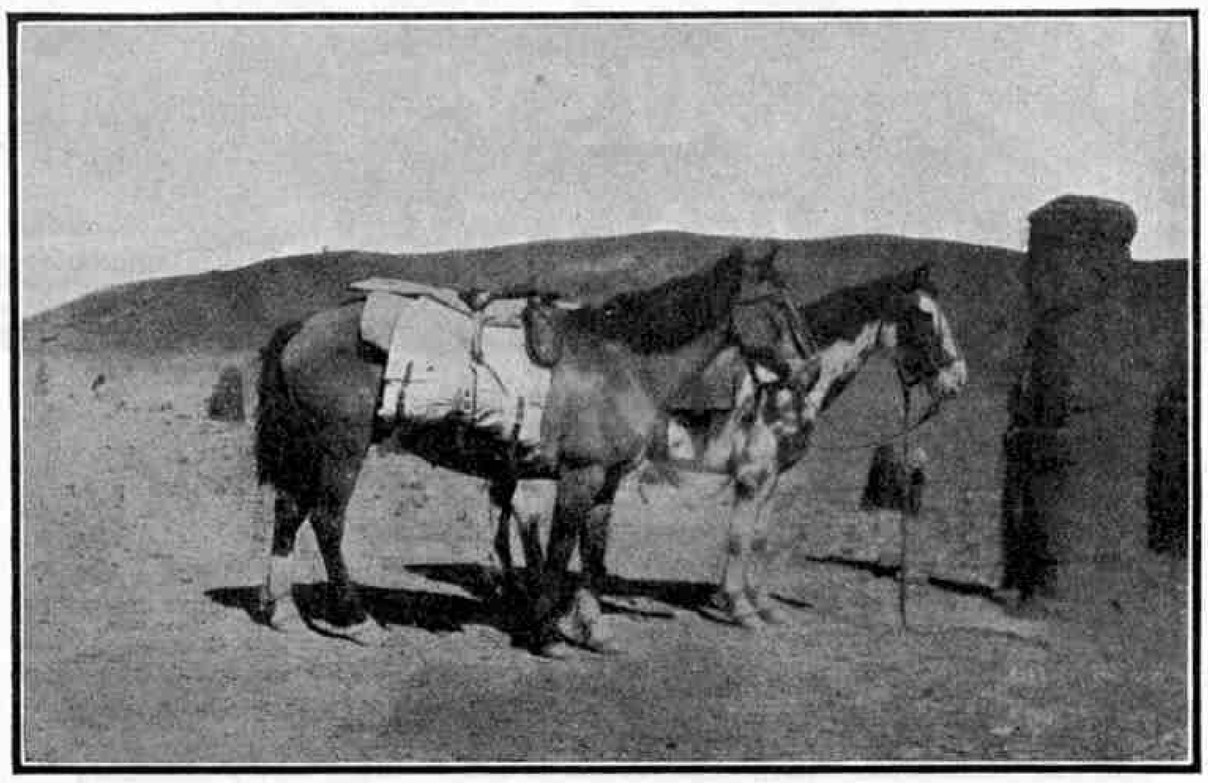
*"*Southern Cross to Pole Star*," by A. F. Tschiffely. (William Heinemann Ltd. 15/- net.)*

mountain sides. During this stage, as elsewhere on the trip, one of the main difficulties was to find sufficient fodder for the horses; often there was nothing but barley straw. The author seems to have been greatly impressed by the extraordinary number of Bolivian "fiestas," or feasts, and the surprising amount of alcohol consumed on each occasion by the Indians.

At La Paz the author was received with enthusiasm at the Argentine Embassy and spent some pleasant days while the horses were resting and revelling in the best of fodder. From here the sacred Lake Titicaca was soon reached, after passing the enormous stone pillars that are all that is left of the prehistoric temple of Tiahuanaco. Some idea of the vastness of this lake, the highest navigable water in the world—11,400 ft. above sea level—may be gained from the fact that modern steamers take 12 hours to make the trip from end to end. These steamers were built in England, sailed out to the Pacific port of Mollendo, dismantled and transported by rail to Puno, the port at the Peruvian end of the lake, and there reassembled. Travelling along the western shores of the lake the author crossed the border into Peru, and rested for a day at Puno.

Shortly after leaving Puno, *Gato* saved his master's life by his intelligence. "The horses had already waded through soft puddles that gurgled in a very unpleasant way with our weight, and when we came to a broad strip of water which appeared to be traversing the plain from side to side, *Gato*, whom I was riding, refused to move further. The water was only some four inches deep, but the horse propped with the stubbornness of a bad-tempered mule, and when I hit him with the lead line he reared up and snorted like a bronco. I tried every means of persuasion to make the horses enter the water, but all my efforts were of no avail. Presently I saw an Indian in the distance who seemed to be shouting and waving his arms whilst he came running in my direction. When he was near enough I heard him calling to me in broken Spanish to stop. Once he had sufficiently recovered his breath to speak he told me that this was a very dangerous place and that we would meet with disaster if we entered the treacherous pool. He then guided us to a spot far away and put us on a safe trail. *Gato* had taught me a good lesson, and I never interfered with him again when he refused to step on a doubtful piece of ground."

At Cuzco, the ancient city of the Incas, the author stopped to visit the marvellous ruins and then passed on into the heart of the Andes. Here riding became extremely difficult on account of the steep zig-zag slopes with loose rocks, and often it was necessary to dismount and walk. "It is much more tiring to go mounted up or down such steep and rough inclines, and the danger of a nasty fall is ever present. Whenever I came to precipitous trails, and there were many, I divided the pack between the horses; if we had to go downhill I went ahead, but when climbing I put *Mancha* in front and caught hold of his tail, and in this way he pulled me along without much effort. I always put him in front because he obeyed my commands, and I could guide him in any direction by pulling his tail one way or the other."



Mancha and Gato inspect a prehistoric Monolith.

The conditions grew still worse. "Sometimes we were winding our way through narrow and deep valleys, with walls of rock that seemed to reach the clouds on either side, and then again we had to zig-zag up a rough trail, stumbling, scrambling and slipping. Men and beasts were dripping with perspiration, and every now and again we had to halt to recover our breath, and so we slowly climbed higher and higher. . . Often the track was cut out of a perpendicular mountain wall, with a giddy fall down to the river, which from above looked like a winding streak of silver. In some places these trails are so narrow that the pack animals have to walk near the edge to avoid bumping against the rocky wall, and it would be impossible to cross animals coming in the opposite direction. I have been told of incidents in the Andes when two riders happened to have met in such narrow places, and when the man who shot first was the one who saved himself, for neither turning back nor crossing each other would have been possible in these traps."

The town of Ayacucho and comparative civilisation provided a welcome rest and food for man and horses, together with the pleasant thought that the second main ridge of the Andes was passed. It was less pleasant, however, to find that, owing to landslides and swollen rivers, the road forward could not be followed. A long detour over the mountains was necessary, and the author took an Indian guide who deserted him one night, taking all the food supplies. After many trying experiences he reached Lima, the capital of Peru, where he witnessed a bullfight, and tried the experience of smoking opium, with unpleasant results. From Lima his route led across the sandy deserts of the Bolivian coast to Trujillo, one of the largest towns of Peru; and, after a perilous crossing of the swollen River Santa, over the frontier into the highland of Ecuador.

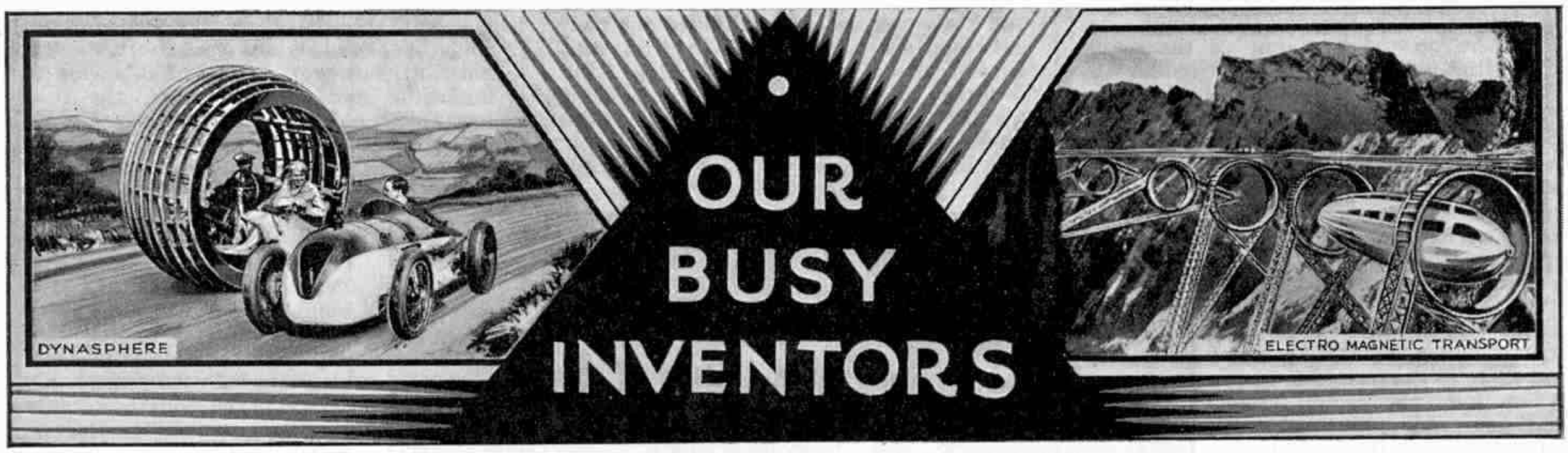
Across mountains and through mud the author reached Quito, and crossed the line into Colombia. A side journey to Bogota, the capital, to collect geographical information, was followed by a strenuous ride through the great swamp barrier and so to Medellin; then by steamboat to Calamar; overland to Cartagena and again by steamboat to Colon in the Panama Canal zone. The Panama Canal was crossed by way of the closed water-level gates at Pedro Miguel, and the journey was continued through Panama to Santiago and on into Costa Rica. More mountain climbing followed, leading to San Jose; and in spite of a revolution in progress San Salvador was safely reached. Crossing the Guatemalan border to Guatemala City was fairly good going, and through Mexico the author received everywhere an almost embarrassing welcome, culminating in a great reception at Mexico city, with bullfights and other entertainments. The United States border was crossed at Laredo, and the wild part of the journey was ended. The remainder of the trip was comparatively easy, except for the motor traffic, which upset the horses considerably; and in due course Washington, the end of the journey, was reached.



Branding colts in the Argentine Pampas.

In two and a half years Mr. Tschiffely had ridden 10,000 miles over cold, barren 16,000-ft. ranges, down into steamy jungles, across the Isthmus of Panama, up through Central America and Mexico, and so to the United States. He reached Washington with the same two horses with which he started, and with both in perfect condition. His lonely trail ran to a great extent remote from cities and seaports, far from white men's haunts. One night camp might be pitched far from any human habitation; on other nights he ate and slept with ancient Indian tribes in stone villages older than the Incas. He tells the story of his adventures with his horses, with friendly and hostile Indians, cowboys, soldiers and officials, with straightforward power that immediately convinces and fascinates.

This remarkable book, which is illustrated by a large number of interesting photographs, should be read by all who are capable of feeling the thrills of real adventure.



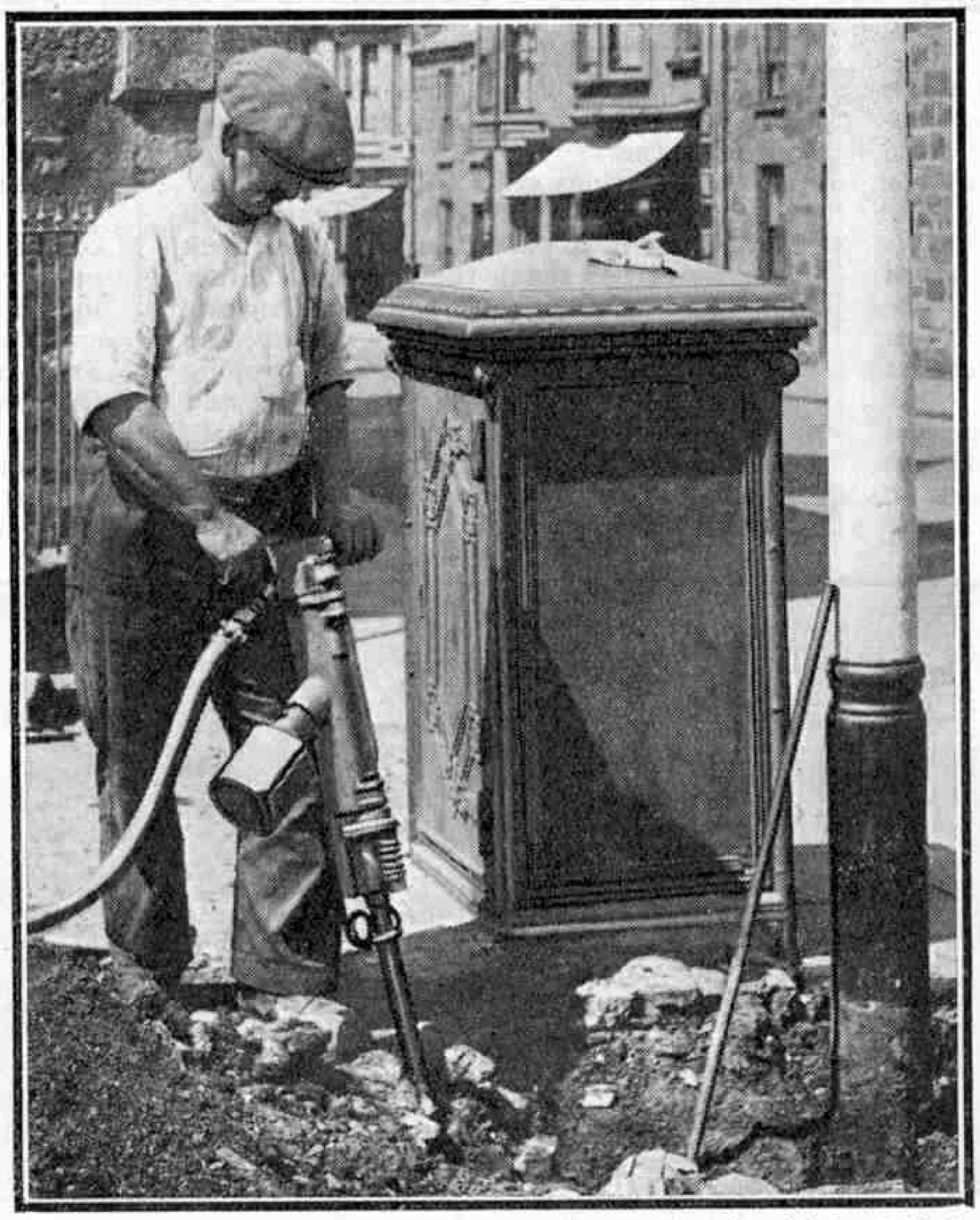
By P. A. Tent

IN my last article, I promised to give my readers an account of some of the more interesting inventions shown at the Exhibition of the Institute of Patentees. As usual, these were widely varied in character, and seemed to me to cover almost every branch of human activity. Competition for the chief prizes was very intense, and many of those who were not successful in gaining major awards showed inventions of sufficient novelty and ingenuity to attract special attention and to qualify for certificates of merit.

Electrical Devices at the Exhibition of Inventions

It is interesting to find that the Institute's Gold Medal was won this year by a woman. Mrs. E. Richardson, the fortunate exhibitor, showed a group of devices for finding or identifying wireless stations, the chief being the Zonograph Dial, which enables stations to be found automatically, or to be identified perfectly. In this section special attention was paid to an improved electric lamp holder and to an automatic gramophone with a special device for changing and removing the records, and another interesting exhibit was a warning device for the deaf in which the lighting system of a house is connected with the electric bells.

An exceptionally high standard was reached in the Mechanical Devices Section, where the most successful exhibit, which won the Institute's Silver Medal, was a traffic control light signal in which only one main light is employed for red, green and amber signals. Four smaller pilot lights are fitted above and below the main light, and these are extinguished in rotation to show exactly how much remains of the period during which the main signal is visible. This auxiliary device is so simply and ingeniously designed that it can easily be fitted to existing signals, and the entire apparatus is small and reliable in action, and also has the great advantage that it is economical to manufacture.



At work with a road ripper to which the silencer described in this article is attached. This photograph and the one in the centre of the opposite page are reproduced by courtesy of Holman Bros. Ltd., Camborne.

Other attractive exhibits in this section included a simple form of pre-selector gear box that can easily be repaired if necessary by any motor engineer, and an emergency valve for supplying air to the crew of a sunken submarine. A very simple idea that received commendation was a new form of wooden holder for files or chisels. A special feature of this was a ferrule fitted without reducing the diameter of the handle, a plan that avoids weakening the holder at the point where strength is wanted.

Attractive Household Gadgets

Great interest is always taken in the household devices shown at the Exhibition, and this year's display demonstrated how much ingenuity is constantly being exercised in thinking out new gadgets, and improving old ones, in order to make our homes more comfortable or to save time and labour in running them. A kettle that gives its own alarm when the water in it boils, a fuel economiser for firegrates, improved fixings for chair webbing and a spring curtain rod were among the inventions shown in this section, but one that seemed to attract the greatest attention was an electric iron that formed pleats as if by magic. When this iron was examined it was seen to have two pressings attached to its nose that gathered the material into pleats and kept it there until the iron had passed over them. The device was remarkably simple, and formed an excellent example of the cleverness and ingenuity of the modern inventor.

How Inventions Aid Doctors

The astonishing variety of inventions displayed at the Annual Exhibitions organised by The Institute of Patentees seem to me to prove conclusively that the inventor's influence is more far-reaching than is usually thought. The exhibits at a Medical Exhibition held recently in London emphasised this by showing the part played by inventions in the work of the doctor. One of the most remarkable of the machines demonstrated there was what is called a portable electro-cardiograph, which simply means an electrical instrument for recording heart beats. This can be operated from ordinary household mains and, unlike much of the apparatus that doctors and dentists use, is by no means formidable to patients. Simple contacts are attached to the wrist and leg of the individual whose heart beats are being examined, and these trace out on a sheet of frosted glass a zig-zag line of which a permanent record can be made by photography. It then can be studied at leisure by the doctor, and of course gives him a much better opportunity of learning the state of his patient's heart than the noises heard in a stethoscope could do.

Gramophone That Makes No Sound

An equally interesting exhibit was a silent gramophone! This apparent impossibility is not a device for protection against gramophone fiends who insist on playing records as loudly as possible at unsuitable times, but a scientific instrument intended chiefly for teaching deaf children. It does not produce sounds audible in the ordinary way, but transmits the sound vibrations produced by records played on it to a small pad instead of a loud speaker or horn. The pad is mounted on a handle and speech or music is heard when it is held in contact with any part of the skull, the vibrations being transmitted through the bones.

Even a person who is stone deaf can listen to gramophone records

with the aid of this wonderful instrument. One interesting way of "listening" to the sounds it produces is to hold the pad between the teeth. This will remind many of my readers of the trick in which a watch is held between the teeth, when its ticking is heard much more distinctly than when it is held in the air at an equal distance from the ear.

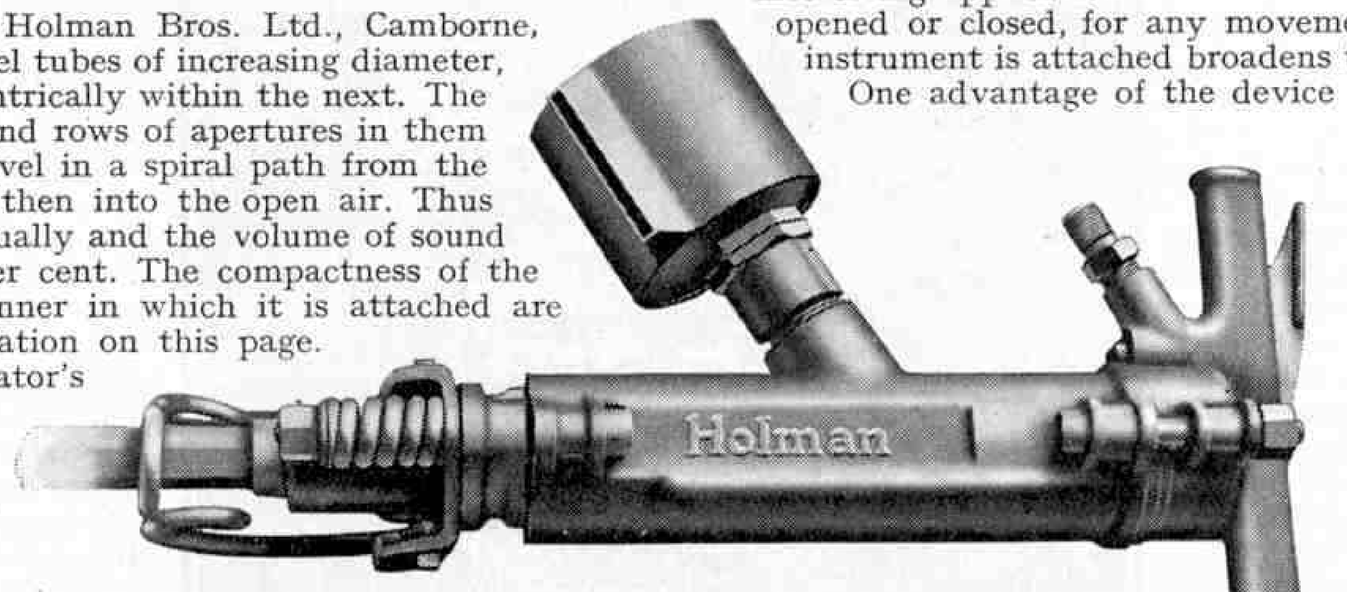
Other interesting things to be seen at the Exhibition included a shock-proof X-ray plant that works off ordinary mains supply and can be used readily by a doctor in his own consulting room, and tablets containing Vitamin C in pure form. This vitamin is the one that is instrumental in preventing rickets and similar diseases and has only recently been isolated in pure form. Each of the white tablets exhibited is equivalent in Vitamin C content to two teaspoonfuls of orange juice.

Most people to-day would laugh at the suggestion that the sting of a bee is a cure for rheumatism. Treatment of this kind suggests one of the quaint but useless remedies of our forefathers, and to many it will be surprising to learn that up-to-date doctors actually use the poison in the bee's sting for this purpose. An indiscriminate attack on a beehive in order to provoke retaliation is not advised, however. Instead the venom is squeezed from the stings of bees in a huge factory in Germany where 90,000 of these creatures are made to give a daily supply, and is then combined with a fatty paste to form a salve.

Silencing the Pneumatic Drill

Every reader is familiar with the din that pneumatic drills create when at work and many will welcome the silent tool illustrated on the opposite page. It is of course impossible to eliminate the metallic sound made when the piston of the drill strikes the anvil block, or the shank end of the drilling steel. This is less harmful in its effects than the disturbances caused by the exhaust, however, and noise due to this cause is effectively dealt with by the silencer attached to the road ripper seen in action in the photograph.

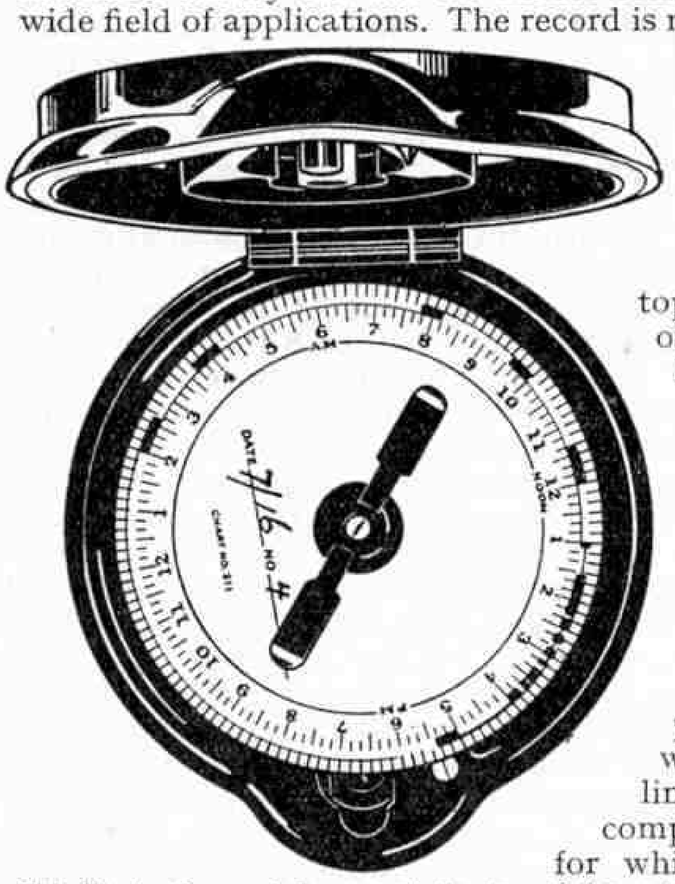
The silencer is made by Holman Bros. Ltd., Camborne, and consists of a series of steel tubes of increasing diameter, each of which is placed eccentrically within the next. The tubes are welded together, and rows of apertures in them cause the exhaust air to travel in a spiral path from the smallest to the largest, and then into the open air. Thus the pressure is reduced gradually and the volume of sound diminished by at least 60 per cent. The compactness of the silencer and the simple manner in which it is attached are shown in the central illustration on this page. It does not get in the operator's way, and as it weighs only 5½ lb. it makes an almost inappreciable difference to the weight of the tool to which it is fitted.



Close-up view of the silencer fitted to the road ripper shown in action on the opposite page.

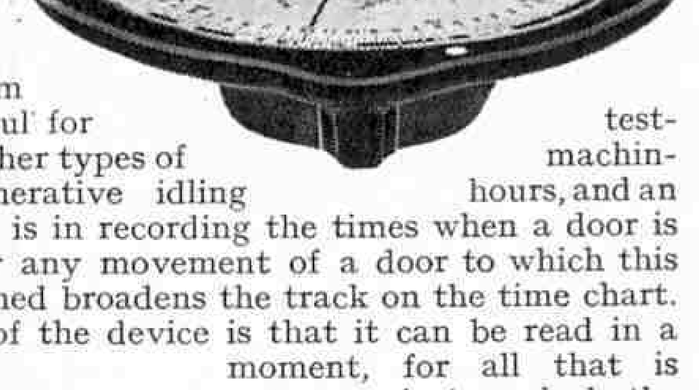
Checking a Motor Lorry's Running Time

The two remaining illustrations I have included on this page show an interesting device for automatically recording movements on a time chart. It is known as the "Servis" Recorder, and is intended chiefly for use on motor lorries, but has a remarkably wide field of applications. The record is made by a small pendulum, mounted on ball-bearing supports, from one end of which projects a metal point. The pendulum is mounted in one half of the recorder, as shown in the illustration at the top of the page, and in the other, which closes over it like the back of a watch, is a circular card coated with wax and driven by means of clockwork to rotate once in 12 hrs. or in some other suitable period. The device is simply screwed on to a convenient point on the lorry and the metal point scratches away the wax covering along a thin line on the rotating card, completing a circle in the time for which the clockwork is designed. This line is readily visible, for the card itself is red. While the lorry is in motion the vibration causes the pendulum to oscillate about its central position, and all running time therefore is shown on the card by the presence of a thicker red line.



This illustration and the one at the top of the page show the chart and pendulum respectively of the "Servis" Recorder described on this page. They are reproduced by courtesy of Servis Recorders Ltd.

As can be seen in the illustration in the bottom left-hand corner, the circular line is cut along a scale of hours. The performance of a lorry to which the mechanism is fitted therefore can be read at a glance, and the information given to the owners enables them to plan out work to the best advantage, and to take steps to reduce as far as possible all standing time involved in loading and unloading, and in unnecessary waiting. The recorder also can be used for detecting unauthorised use of a motor vehicle of any type.



The recorder is so sensitive that it will work if it is merely nailed on some part of the lorry, and it even responds to engine vibration when the lorry is standing by cutting a line of medium thickness. It is also useful for testing the performance of other types of machinery, revealing unremunerative idling hours, and an interesting application is in recording the times when a door is opened or closed, for any movement of a door to which this instrument is attached broadens the track on the time chart.

One advantage of the device is that it can be read in a moment, for all that is necessary is to unlock the case by means of the Yale key provided and to glance at the card inside it.

Looking Underground by Periscope

A gigantic periscope is being used in America to enable engineers to look underground. The purpose for which the instrument has been devised is to examine cracks in the rock on which is being built the Norris Dam, a gigantic concrete wall in Eastern Tennessee that eventually will hold up a lake containing more than 17 million cu. ft. of water. The cracks were full of clay and have been washed out and grouted, or filled with concrete, and the periscope is being used to follow the progress of the grouting material.

This novel instrument consists of a brass tube 3¼ in. in diameter made in 10-ft. sections that can be fitted together to give a total length of 30 ft., or even more. A small telescope is fitted to the top of the tube and at the bottom is a mirror set at an angle of 45 deg., with a 500-watt lamp immediately below it. The wall of the tube is cut away opposite the mirror and lamp, and for use the instrument is lowered into holes 5½ in. in diameter drilled into the rock.

Shoals of Fish Found by Echo-Sounding

References have previously been made in the *"M.M."* to echo-sounding, or the measurement of the depth of the sea by finding the time required for wireless waves to be echoed back from the sea floor to the vessel from which they are sent out. In recent years this method has been developed in a remarkable manner, and it is very satisfactory to know that the British Admiralty has been largely concerned in the improvements that have made it so reliable. The time required for wireless waves to travel to the bottom of the sea and to return is almost infinitesimal and depths can be measured practically instantaneously and continuously.

The echo is now made to draw its own record on paper in the form of a curve similar in general appearance to that traced by a recording barometer, and the depth at any moment also is shown on a dial. The instruments are so delicate and accurate that they can reveal the positions of wrecks on the sea floor, and even detect the presence of a shoal of fish by a sudden shallowing in a part of the sea where the real depth is known.

The Great "White Ways" of the Maya

A Centuries-old Road Roller

THE discovery in the jungle-covered region of north-eastern Yucatan, 40 miles out of Cobá, of a segment of solid stone, 13 ft. long, 2¼ ft. in diameter, and weighing about five tons, nicely fashioned into cylindrical form, has drawn attention once again to the fact that the ancient occupants of an area, long uninhabited, numbered among the other remarkable skills to which they had attained, the building of raised roads of paved stone.

It seems probable that this great stone cylinder was designed to be used in packing down into solid mass successive courses of material, particularly surfacing material, as these were added in the process of road construction. Presumably, gangs of labourers on the road, possibly slaves working under threat of the lash, possibly captives taken in combat, pushed such cylinders about as the work proceeded and in so doing anticipated by many centuries the advent of the steam- or petrol-driven metal roller, so essential to road-making of to-day.

Cobá, a Maya city of consequence during pre-Columbian days, as shown by abundant archæological evidence, but now long abandoned, lies about 65 miles east by south of Chichen Itzá, the headquarters of the archæological field staff of Carnegie Institution of Washington. Study of Cobá and the region thereabouts has revealed the fact that it is at the centre of a network of raised, constructed roads that run off north, east, south, and west, and connect various groups of ruins located about the chain of small, freshwater lakes that is such a distinguishing feature of the district.

One great road that takes to the westward from Cobá had been thought to end at the ruins of Yaxuná, about 12 miles south-southwest of Chichen Itzá, but no one had ever traced its course from end to end.

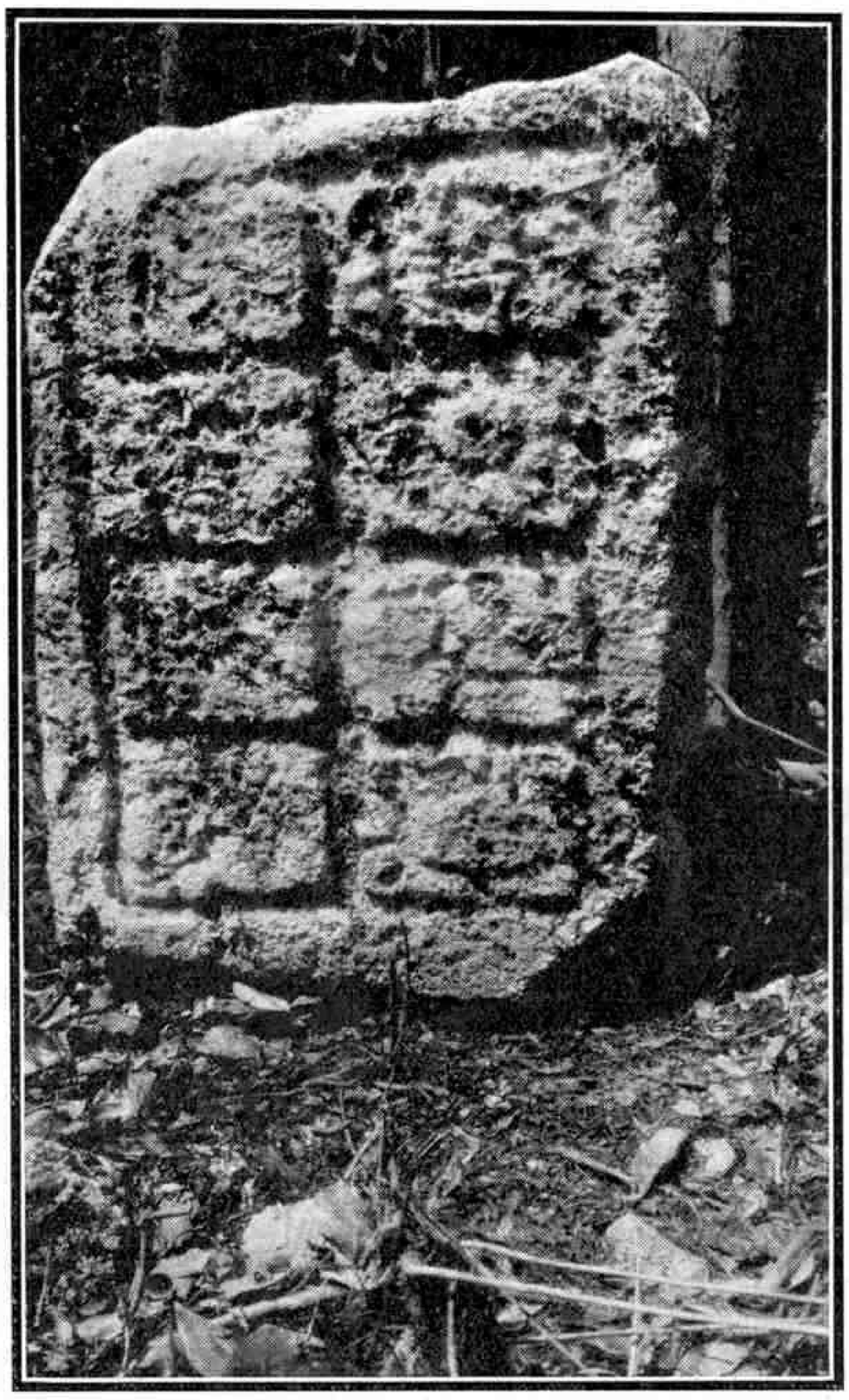
The region is difficult to traverse. Low bush and jungle, the characteristic covering of the section towards the west, merging as it does with the tall rain-forest towards the east, effectively obscures all surface features. Again, the limestone formation that underlies the entire area is so porous that water is not to be had except in a few favoured localities, the Cobá district, with its chain of lakes, being the most notable. Moreover, the region around Cobá is without permanent population. A few chicle gatherers, who engage in tapping the sapodilla trees during the rainy season and who occupy temporary camps, and occasional hunters in search of game, are the only people now to be found in a region that once sustained a numerous population.

Because of these conditions, and because of the difficulty of penetrating the jungle tangle where no trail exists, this once magnificent highway, glimpsed only here and there at breaks in the forest growth, had never been followed through.

For many years, Dr. Sylvanus G. Morley, in charge of the Carnegie Institution field staff, had hoped for opportunity to determine the facts about this the greatest of all the causeways running out of Cobá. Finally, in 1933, the time seemed propitious and he set about organising and equipping an expedition.

To head the expedition he chose Alfonso Villa, a young schoolmaster of the Yucatecan race, who for the previous three years had been assisting Professor Robert Redfield of Chicago University, a Research Associate of Carnegie Institution, in study of the life of Chan Kom, a modern though isolated Yucatecan village. Drs. Morley and Redfield commissioned Villa to select 12 Maya Indians to accompany him, to equip a pack-train with supplies and water-carrying receptacles, to enter the road at Yaxuná, and to follow it wherever it led, making a traverse survey as he went.

It was on 27th February 1933 that Villa and his party entered the jungle at Yaxuná prepared to trace the road, to plot its curves, to measure its length, and to study the details of its construction. Three weeks later the party emerged from the forest at Cobá, 62½ miles distant, as shown by a steel tape that the party carried. By following the road throughout its entire distance Villa demonstrated conclusively the correctness of early conjectures that Yaxuná and Cobá were the termini of this great causeway.



One of six inscribed stones found on an ancient Maya causeway. The illustrations to this article are reproduced by courtesy of the Carnegie Institution of Washington.

It was while cutting his way through the thick bush, 22 miles out of Yaxuná, that Villa came upon the stone roller, which may fairly be called the first American road roller—lying on top of the causeway towards one side, in all probability just where it had been left by the builders centuries before. Sun and wind and weather and the passing years have treated it badly, for the shaft is broken in two nearly midway of its length. Moreover, segments of considerable size have flaked off, but enough remains to satisfy the observer that it had been quarried and given cylindrical shape for a purpose, the most plausible being that of use in road construction and road upkeep.

At the Yaxuná end the road takes off from a small pyramid at the centre of a great number of mounds, originally structures of various types, which now, however, except for a single acropolis-like building, still standing but badly weathered, comprises all that is left of this one-time important city. For 43 miles out of Yaxuná the road runs almost perfectly straight, and in the remaining 19½ miles its original direction changes but four times, and only slightly at that. In width, the road is from 30 to 34 ft.; in height to which it is built up above the surface level of the terrain, it varies from 2 ft. to 8 ft.

In construction of their roads, the ancient engineers began by digging down to hardpan, which is near the surface, and erecting retaining walls on each side to the height to which they desired to bring the road. These walls were built of large, roughly faced limestone set in mortar. Into the space between the walls a layer of heavy boulders, some of them 2 ft. or 3 ft. in length and weighing many hundreds of pounds, were carefully laid, and the spaces between chinked with smaller stones, fitted, and hammered into position. Other courses followed, each of successively smaller boulders and stones, quite as carefully placed, until the road had been brought to the requisite height, whereupon a layer of rock broken into much finer pieces was added. After this was hammered or rolled into a hard, level surface, a final coating of mortar cement was applied.

The modern Indian name for the ancient stone roads of Yucatan is *sache* (plural, *sacheob*) which means, literally, "white road." The name is of remote origin; it is probable that it is the name the builders themselves used, though this is not certain. However this

may be, the name is peculiarly expressive, for the surfacing coat of mortar cement that was applied was made of lime mixed with finely sifted white earth, called *sascab*, which, originally, under the tropical sun, must have given the roads a dazzling appearance, quite as dazzling, perhaps, as the great "white ways" of our own cities.

Earl Morris of the Carnegie Institution staff, who has studied the processes used by the Maya builders who worked with stone, says that this *sascab*, or white earth, is a sort of breccia or conglomerate lying beneath the limestone caprock of the country, and that in ancient times it was mixed with slacked lime as masons with us to-day use sand. He adds that the miners burrowed about for it wherever the digging was easiest, and that the region around Chichen Itzá is full of caves where it was dug, one of them being 20 ft. deep and large enough to shelter 200 people.



The Maya causeways were raised above the general ground level. This is a side view of one of them at its greatest height, 8 ft.

It was cement made in this way that was used to such good effect in temple construction, providing hard and durable coverings for the floors, and the fine-grained wall surfaces of glossy smoothness so suitable as backgrounds for the frescoes and murals with which the ancient artists adorned the walls. Morris states that in the "old days," when there was less hurry, the masons took great pains in preparing the cement, stirring and remoistening it daily for many days, and, when applied, tamping it with wooden mauls for hours on end until it became as poreless and as compact as stone.

He also says that when needed the surface paste, as it was being tamped and finally trowelled, was remoistened with a solution made by soaking the bark of the *chilom* tree in water. Given this treatment, the cement is not only rendered practically impervious to water but, under the trowel of the mason, it takes on a magnificent polish.



The "First American Road Roller," found where it was left by the Maya road builders centuries ago.

Although evidence of the existence of these *sacheob* have been found at a few points in the Yucatan Peninsula, nevertheless, the Cobá region is unique in the extent and elaborateness of its system of causeways. Sixteen of these raised roads, varying in length from a few miles to 62½ miles, the length of the Yaxuná-Cobá road, terminate within the great body of ruins about the chain of lakes.

One cannot be too sure of dates when dealing with Maya history, but there is much evidence to support the statement that at the middle of the fourth century A.D. the Cobá region was occupied by an organised and established people who were capable of building these great causeways. It is probable that they were begun during this century and completed before the end of the seventh. Why they were built is a mystery. The Maya had no beasts of burden, as had the road-building Inca of Peru; nor wheeled vehicles, as had the Romans, the greatest road builders of ancient times; yet, in durability, in evidence of careful workmanship, and in prodigious expenditure of labour in construction and upkeep, the roads of Cobá must have compared favourably with those of both.

Apparently these highways were built for travellers afoot, and for men bearing palanquins and carrying burdens upon their backs. If so, and if these 16 known roads were utilised to capacity, what an amazing picture of the activity of that day and region the imagination presents! Four files of men with their loads could easily pass, so wide were the roads, two lines going in one direction and two in the other.

Road building calls for organised community action of a relatively high order. Savage man builds no roads nor has he conscious need for them. When, however, mankind advances to the settlement-forming stage of civilisation, the hunter's trail becomes inadequate and roadmaking begins. The magnificent causeways of Cobá testify eloquently to the fact that the Maya of that region and period, in possessing the capacity to plan and execute community projects calling for so great a degree of organising ability, had come a long way along the path of civilisation. They also indicate that Cobá, the focal point of all these great roads, must have wielded a powerful influence in all matters touching the life of the people throughout a great area roundabout.

The stone illustrated on the previous page and five others are about 2½ ft. high, 1½ ft. wide and 1 ft. thick, and in each case are inscribed on one face with Maya hieroglyphs. These inscriptions are probably dates, but unfortunately they are so badly weathered that it is impossible to decipher them. The stones may have been erected to record completion of a section of road or may have been set up to mark distances.

It is strange, as well as disquieting, that a people as numerous and as virile as the Cobá region contained could disappear, that their farms, their homes, their villages and cities, their temples, their great causeways, could be swallowed up by the jungle; and that their very existence could be so nearly forgotten.

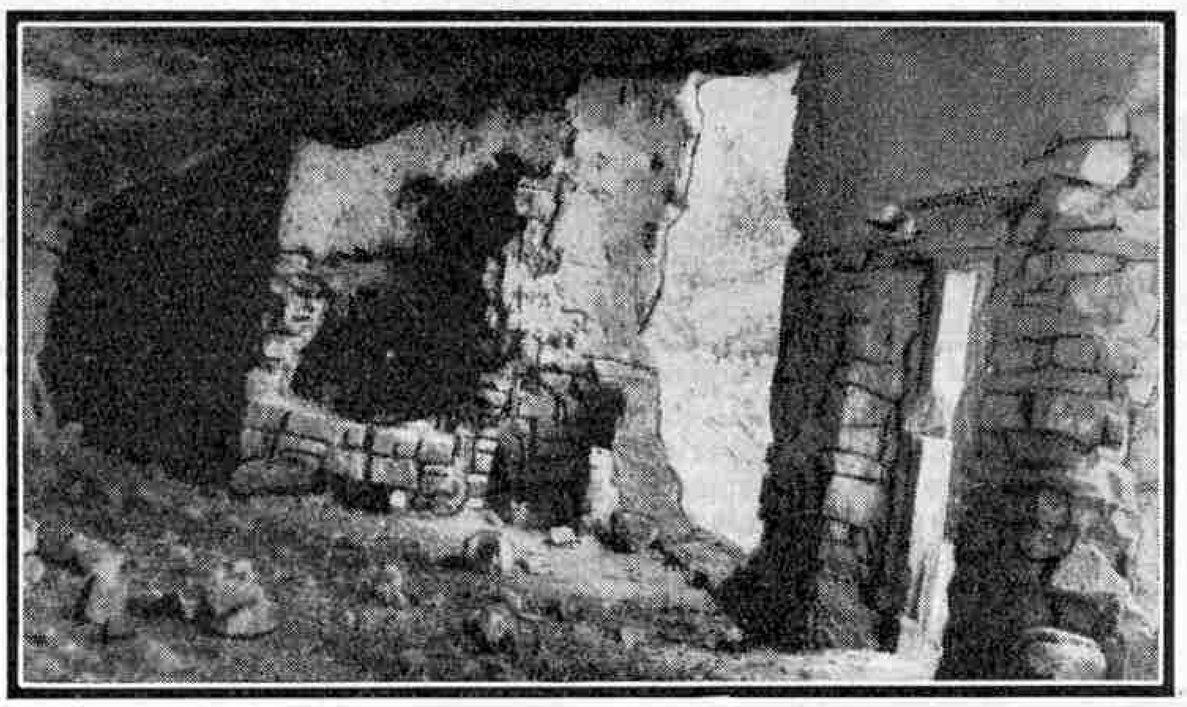
We are indebted to the courtesy of the Carnegie Institution of Washington for the information in this article.



These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Unique Cave Dwellings

The mention of cave dwellings arouses thoughts of the primitive homes of prehistoric Man. At Stone, between Rotherham and Blyth, there are still to be seen the remains of cave dwellings that were inhabited comparatively recently, however, and I have spoken to people now living who once resided in them. All say that their novel homes were quite comfortable, and one woman makes an annual pilgrimage to Stone in order to spend a few days near the remains of her old homestead.



The remains of a blacksmith's shop built by erecting a wall in front of a cave. This was part of a system of cave dwellings inhabited until about 30 years ago at Stone, Yorkshire. Photograph by W. C. Wilkinson, Sheffield.

These strange dwellings were built high up on the banks of a small stream that flows through the village. There the rock overhangs to a considerable extent, and advantage was taken of this formation. The rock itself formed the rear walls, and the roofs of the buildings and the front walls were built up to it. The space thus enclosed was partitioned off into rooms, and some of the cottages built in this manner had upper floors.

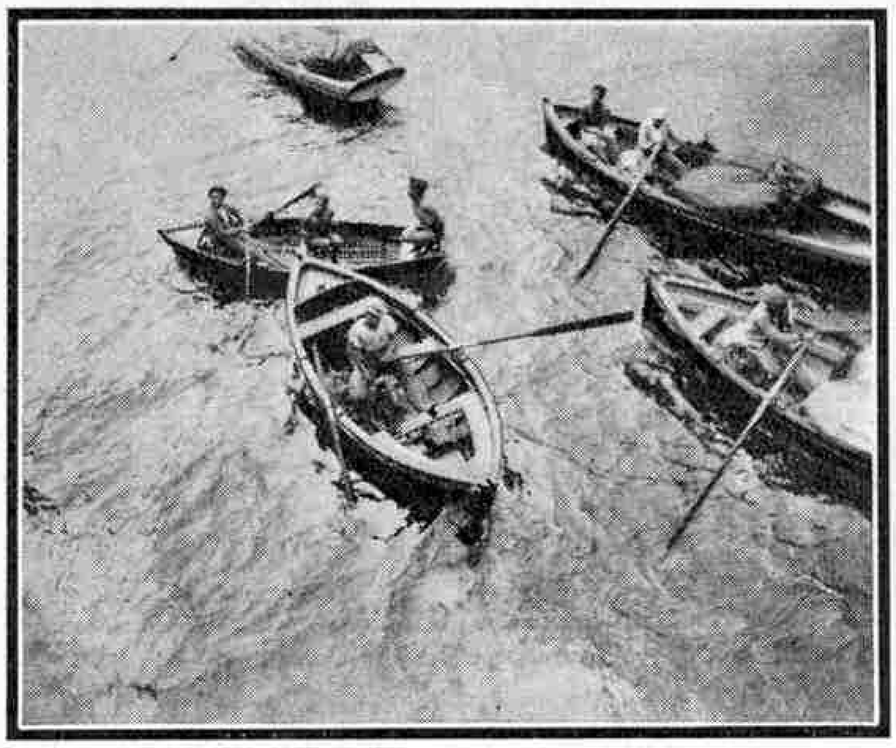
I could not find when these modern cave dwellings were erected, but they were condemned as insanitary about 30 years ago. The walls were then pulled down, but the foundations can still be traced, and fruit trees continue to flourish in the old gardens, although now they are almost lost in the weeds.

The accompanying photograph shows the remains of a blacksmith's shop that was allowed to remain standing for a few years after the cottages were condemned. The fireplace and the site of the bellows can be seen, together with part of the wall and a doorway. The chimney was built to curve upward to the face of the rock, a plan that seems to have been followed in all these strange buildings.

W. C. WILKINSON (Sheffield).

A Visit to Las Palmas

Las Palmas is on Gran Canaria, one of the Canary Islands, and during a recent voyage to South Africa the vessel in which I travelled called there. The island came in sight about nine o'clock one morning, and very soon looked like a huge mountain rising above the sea, for on it is a peak about 6,400 ft. in height. The harbour was reached about two hours later and many islanders immediately put off in small boats to meet us. They were provided with rope ladders having hooks attached to their ends, and on coming alongside they threw these up to catch on the rails of our ship. Then they quickly clambered on board and spread out on the deck a wonderful array of goods for sale, including elephants carved in ivory and ebony. These elephants were not very dear, but their price and that of other merchandise was reduced rapidly immediately before the ship was due to sail!



Islanders coming alongside a ship at Las Palmas, in the Canary Islands. Photograph by B. S. O'Leary, Johannesburg.

I went ashore in a motor boat, although the water was fairly rough, and the slimy little landing to which the boat was moored seemed still and quiet after the slight unsteadiness of the ship and the throb of the engines. As I passed through the streets of Las Palmas I noticed that traffic kept to the right, instead of to the left. While on shore I visited a tobacco factory, where I saw tobacco at different stages of manufacture and watched the making and packing of cigarettes. Then it was time to return. After all were on board our vessel was escorted from the harbour by tugs, and soon we were again looking at Las Palmas from a distance and commenting on the presence of snow on the top of the mountain peak in spite of the high temperature that we enjoyed at sea level.

B. S. O'LEARY (Johannesburg).

Impressions of West Africa

After a voyage of about ten days from England a different world is reached. Strange voices then sound on deck, a land of red and green shows through the port-hole, and tall black policemen in shorts walk along outside one's cabin door. When we go on deck, Freetown, the capital and seaport of Sierra Leone, is seen. The first impressions are of red rock and green vegetation. In the sky, birds like our English kestrels, but larger, sail about. Black deck-hands attired in weird and wonderful clothes pace past in their bare feet. Some wear what appears to be football shirts vividly coloured, and all chatter incessantly.

After amusing ourselves throwing pennies to the diving boys we go on shore. Then we realise how hot Sierra Leone can be, and we miss the cool breezes of the sea as we toil painfully up the hill, the streets glaring in their redness, the air simmering. We come suddenly upon a crowded street, and are immediately aware of more colour. Black men pass, their bodies glistening in the sun, or draped in cloth of bright hues, and butterflies flit along, specks of scintillating colour. We come to a native market where natives exhibit coloured wool so bright that it almost causes one to blink; rolls of bread; and textile work, some of which is no doubt manufactured in England, but is sufficiently exotic to dupe the unwary buyer. Native girls sit making work-baskets and weaving patterns; we recognise that here is the genuine article, and stop to buy, or rather to argue, for buying from a native is not an easy affair. The girl states a price at about five times the worth of the article, whereupon we laugh sarcastically and suggest something at about a quarter of the value. The girl makes a gesture of supreme contempt, but works slowly downward, while we work slowly upward, until the transaction is completed. There is plenty of time to spare in Africa.



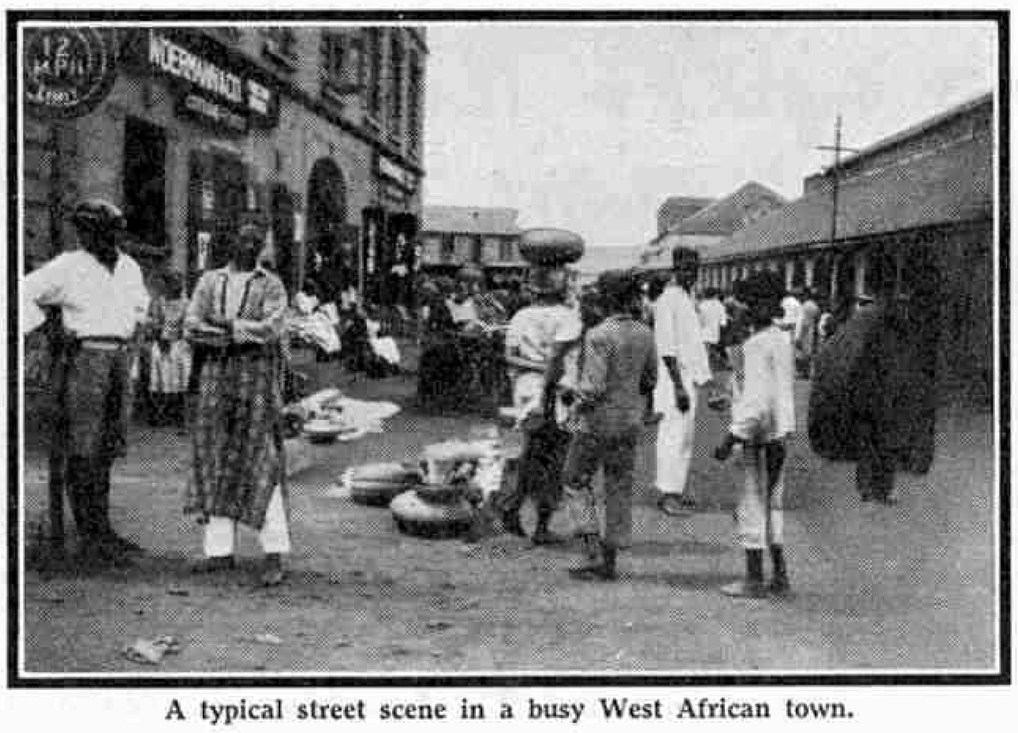
A native policeman on traffic duty at Duala, in the French Cameroons, West Africa. The photographs on this page are by F. W., Cardiff.

We stop to pat the head of a little girl who sucks her thumb and stands dubiously appreciative of the compliment, while her mother looks on stolidly and suspiciously, balancing an earthenware pot on her head. African natives carry practically everything on their heads, and it is even asserted that they will carry a postage stamp in this manner!

Farther to the east there are the French and English Cameroons, often described as the "Garden of the Coast." This is indeed beautiful country, with its palms and flowers, its butterflies and brightly-coloured insects. There Nature is prolific and luxurious, and it is with a queer sense of contrast that one observes the streets, bungalows and motor-cars that are evidence of the white man's coming.

There are traffic problems even in this part of the world, as the upper photograph on this page shows. It was taken in Duala, the chief town of the French Cameroons and the most important seaport of the colony. The white man often is driven by a black chauffeur, and practically every black driver suffers from the obsession that the object of a motor-car is to enable one to get somewhere else in the shortest possible space of time, and to achieve that object he will drive in a manner only mildly described by the word "furiously." The traffic policeman, on the other hand, believes in taking his time. He will sit down on the road until a car is heard screeching in the distance, when he will leisurely rise and wave the car on.

The policeman shown in the picture very courteously posed for his photograph, waving back the woman about to cross the road and assuming an expansive smile. He expected to see his picture immediately after the snap-shotting! F. W. (Cardiff).

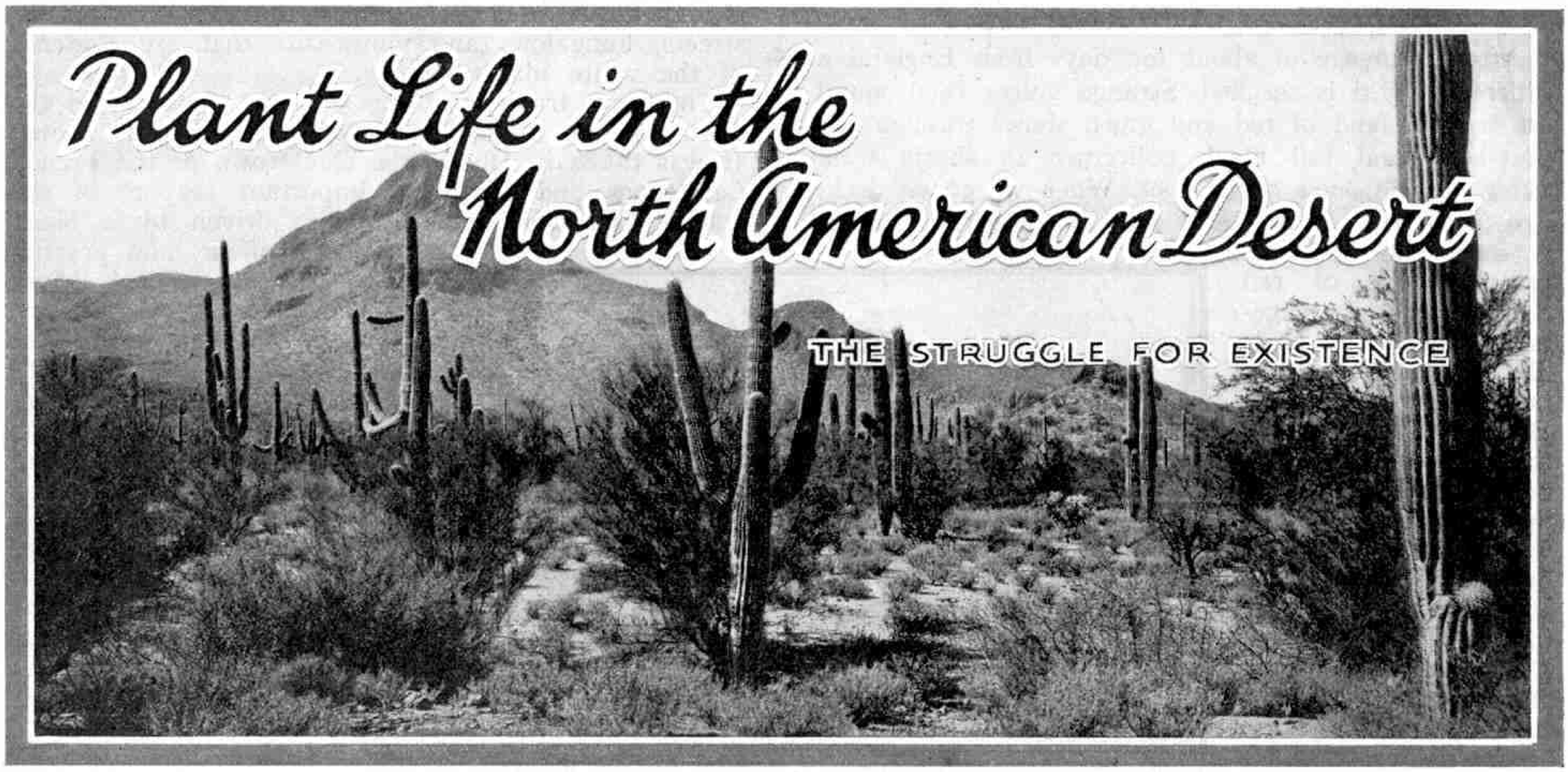


A typical street scene in a busy West African town.

A Visit to a Malt Kiln

Recently I visited a malt kiln, where the first things I saw were long brickwork tanks containing water in which grain was steeping to take up the moisture required for germination. Then I went to the malting floor in the basement of the building, and was surprised by its extent and the lowness of the ceiling. Half the floor was covered with sprouting barley, divided by pathways into islands, called "pieces," and a man was sprinkling water containing an antiseptic over it to prevent the growth of mould. Farther along the floor was an area in which the grain was thinly spread and seemed to have dried and withered. This was raw or "green" malt, ready for roasting.

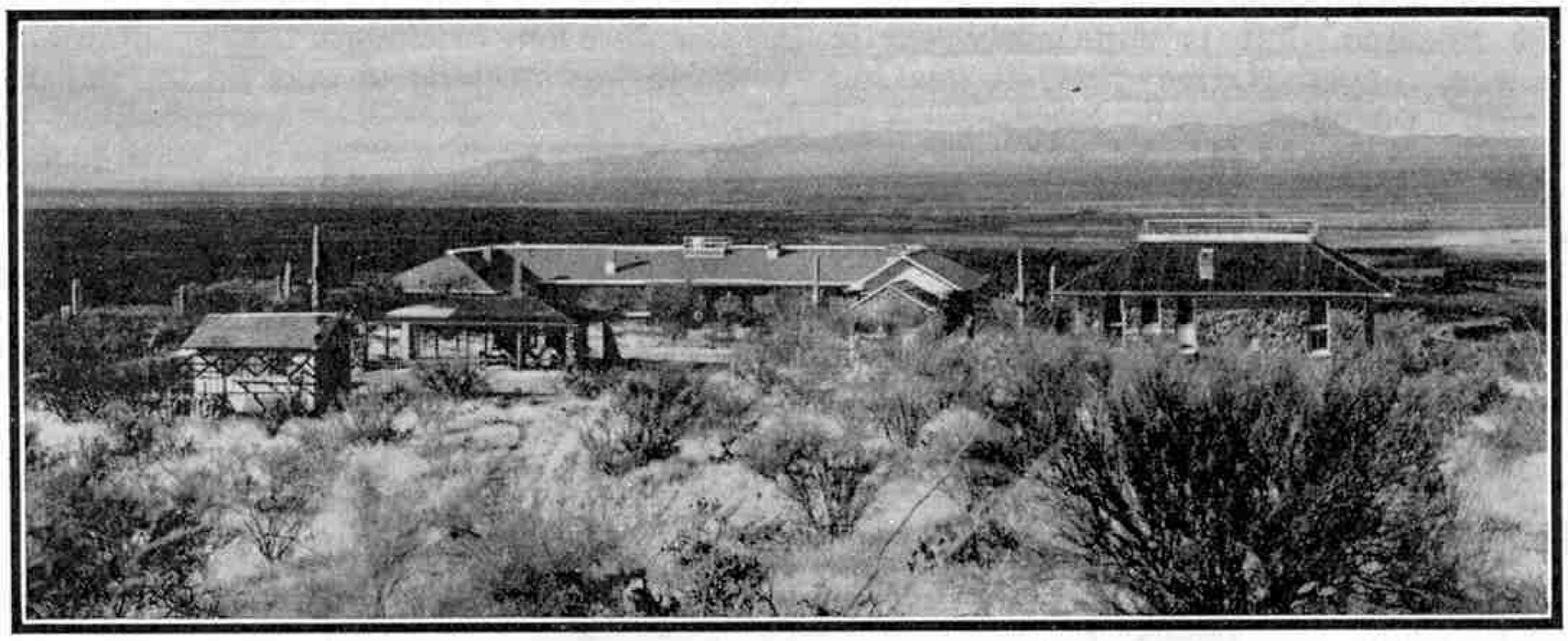
The roasting kilns are chambers with perforated tiled floors, and into one of them men were shovelling green malt to a depth of about 6 in. The maltster told me that a fire of coke and anthracite afterwards would be lighted under the kiln, and the temperature allowed to rise slowly to 150 deg. F. while air was passed in. Men occasionally enter the kiln to turn the malt, and for the last few hours the air is shut off and the temperature raised to about 180 deg. F. This gives the product its characteristic aroma and renders it crumbly. The malt is freed from "culms," or sprouts, and is then graded and stored until it has mellowed. R. TAYLOR (Alne, Yorkshire).



By Dr. FORREST SHREVE (Desert Laboratory of Carnegie Institution of Washington)

THE United States is the only great power that has desert country within its home borders. Some of it is a pronounced type much like the vast unsettled regions in the colonies of Great Britain, France, Italy, and Portugal. Some of it is less arid, and dotted with bushes and cacti. Along their margins the arid lands are bordered by semi-arid ones, in which agriculture is possible but difficult and precarious. Taken together, the arid and semi-arid parts of the United States form 24 per cent. of its area.

Desert is commonly thought of as sandy or stony waste devoid of all life. As a matter of fact there are only a few very small spots in the whole world that would fit this definition. It is nearer the truth to think of desert as country with little rain, few streams, dry soil, high temperature, low humidity, and almost unbroken sunshine.



The heading photograph is of the Tucson region of the Sonoran Desert, 16 miles northwest of the Carnegie Institution's Desert Laboratory, and shows the greatly varied vegetation. The Laboratory is shown in the lower photograph. The illustrations to this article are reproduced by courtesy of the Carnegie Institution of Washington.

It is a country in which the plants are very different from those of moist regions, both in their structure and their physiological features. Some of its animals are of distinctive types, like the Gila monster and the horned lizard; and all of them have habits of life that have been greatly modified.

Investigation of life and conditions in the desert has been made by the Carnegie Institution of Washington for the past 30 years at the Desert Laboratory at Tucson, Arizona, very close to the geographical centre of the North American desert. The aim of the work there is to study all the features by which the plants of the desert have become suited to the conditions under which they manage to exist.

The life of a desert plant is an incessant struggle against adversity from the very start. Of the many seedlings that appear in the rainy seasons, not more than one in a thousand survives to the next rainy period, and few indeed live to reach full size. The scarcity of water, the desiccating effects of the brilliant sunshine, the dry air, and the almost constant wind, together with the ravages of hungry rabbits, mice, birds, and insects, all make life precarious even for the most hardy plants.

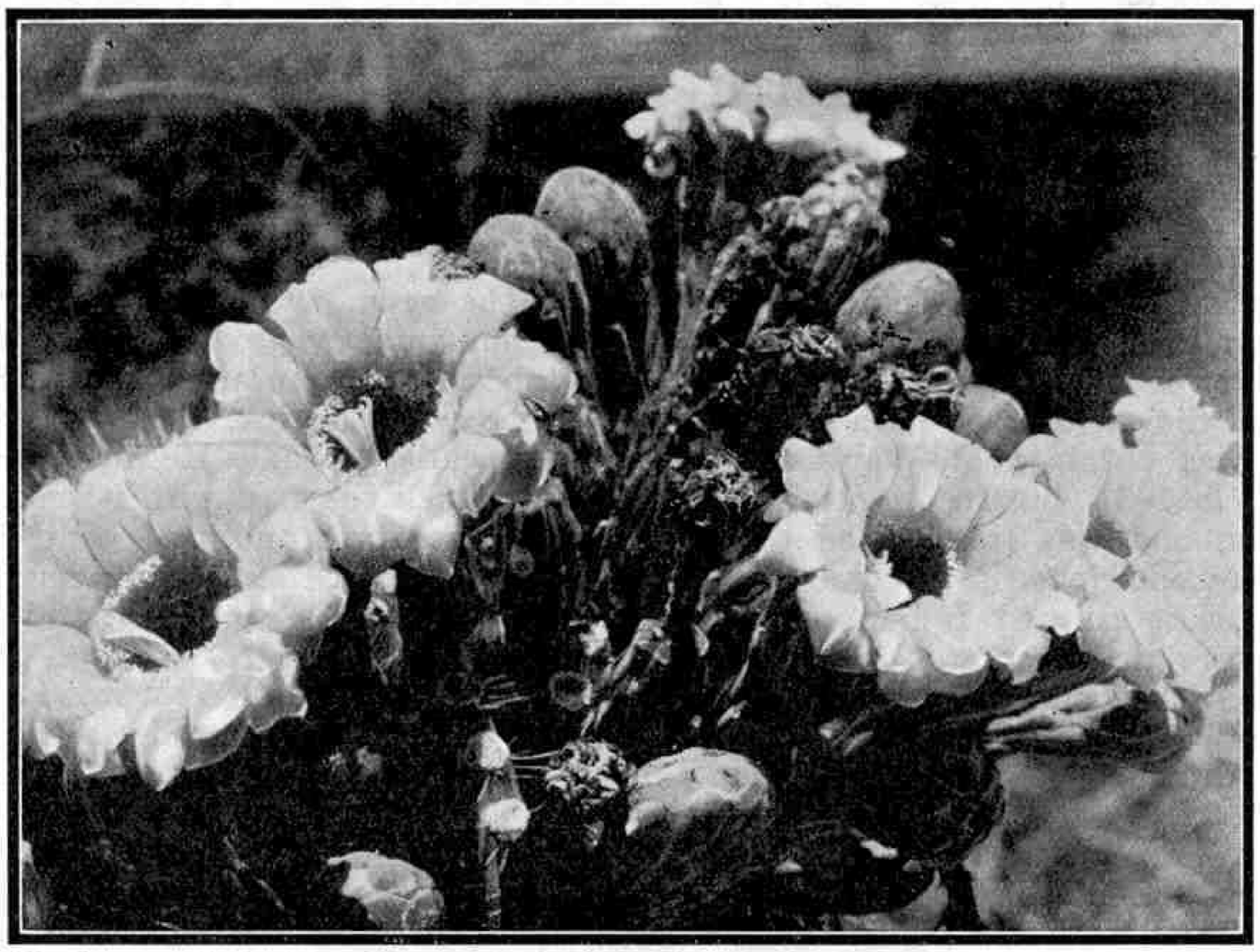
A great deal has been learned about the devices that help plants to meet arid conditions. Some plants grow and flourish during the rainy periods and dodge the whole problem of desert life by existing only as seeds during the dry months. Some of them build up in the rainy seasons a store of water great enough to supply their needs for a year or more. Others send their roots deep into the soil and secure every day a little water to balance what they have lost to the air. The plants in each of these groups have achieved certain advantages, and at the same time have run into difficulties that limit their activity or restrict their distribution.

Every year Dr. T. D. Mallery, an associate in studies at the Desert Laboratory, makes two journeys from Tucson to the Gulf of California, and two to Tinajas Altas, in Southern Yuma County, Arizona, taking readings of rainfall and temperature at a number of stations along the way. By making two trips a year he is able to determine separately the amounts of precipitation in the summer and winter rainy periods. The special type of rain gauge he uses is large enough to hold the normal fall for several years, and is provided with heavy oil to prevent evaporation. The two chains of stations, which have now been maintained for several years, are giving an accurate picture of the conditions that plants encounter in the broad arid region that lies between the outermost settlements and the Gulf.

Tinajas Altas, the "High Tanks," is a series of pools of constant water in deep granite basins. It is on the old Camino del Diablo, or Devil's Road, which in early days was the only pathway between the Spanish settlements on the west coast of Mexico and those in California. Over this sandy, waterless trail struggled the emigrants who made the first settlement at San Francisco. The hardships of the men and women who left Caborca, Sonora, for the nine days' journey to the next water at Tinajas Altas are still vividly depicted

in the many groups of crudely marked graves that line the way.

A complete list of the perennial plants to be found in the broad valleys and bare mountains of the Camino del Diablo is very small. Hardy creosote bushes are the commonest of these, growing up to within 10 ft. of each other in favourable spots, or more often limited to a dozen plants to the acre. Whether there is the usual rainfall of four or five inches a year or no rain at all, the creosote bush is at least able to survive. Like most other desert plants it grows and blooms when it can, but spends most of its life marking time.



The flowers and buds of the giant cactus. This plant grows to a height of 30 ft. to 35 ft., and takes about 200 years to reach full size. The flowers are frequently 3½ in. in diameter and are of great beauty.

An expedition was made in the fall of 1932 to the coast of the Gulf of California in Sonora, and thence towards the mountains by which the state is bordered along its eastern frontier. In the spring of 1933 the desert was traversed from the Bill Williams valley in western Arizona to the Mayo Valley in southern Sonora. These trips yielded a wealth of observations and material. Both of them were accompanied by Dr. Ira L. Wiggins, of Stanford University, who collected plants assiduously all day and shifted driers on them beside the camp fire nearly all night. His university is collaborating with the Carnegie Institution in the investigation of the southwestern deserts, and is gradually building up the collections and accurate knowledge of the plants on which must depend the answers to many questions about the desert country.

The expedition across Sonora from west to east was particularly fruitful in showing the importance of soil conditions in controlling the distribution of the familiar plant communities over a route in which there was little change in latitude and consequently in temperature. An extensive plain, for example, was crossed that was covered with mesquite trees, commonly found only along rivers and known to require a good moisture supply. Here was a veritable orchard far from rivers or hills. It was found that the soil was a fine alluvial clay, and that several streamways poured their water over the entire plain in the violent rains of the summer. As often happens in the desert, there is no outlet from this plain, and never will be until it is filled with soil to the level of some hindering pass in the seaward hills.

A thorough investigation of just such a soil near the Desert Laboratory has shown that it has a nearly constant and wholly adequate supply of moisture at a depth of from 5 ft. to 10 ft., no matter how hot and dry the summer may be or how parched the surface may become. In brief, the orchard of mesquites was drawing on a vast reservoir of water supplied to it by the rains of many square miles beyond its borders. And over these same square miles the plants had been robbed of some of their water by the inexorable work of gravity.



Dr. T. D. Mallery reading the long-period rain gauges by pouring their contents into a graduated flask and waiting for the oil, used to prevent evaporation, to rise, so that the actual amount of rain water can be measured.

The traveller in the desert has a good deal of sympathy with the plants and animals about him, for he too has the problem of water supply. Natural tanks in rock are very few and far apart; the wells in remote settlements are always open, and their water subject to grave suspicion. Economy of water becomes a habit. A tin-cup of the precious fluid is agreed to be ample for a bath; the residue is carefully placed in the radiator of one of the cars. Fuel is to be found in certain places, and the spot for an overnight camp is always selected with a view to its availability. The food supply depends on foresight, with occasional game or chance purchases of beans, chile, or eggs.

One evening on the way from the coast to the hills, a rather bare camping site was selected at sundown and Dr. Wiggins began to scout for wood. In the waning light he inadvertently stepped on the tail of a rattlesnake. Deprived of its customary means of warning intruders, the snake became irritated and struck Dr. Wiggins in the leg. Fortunately his boots were heavy enough to break the fang. He killed the snake and brought it into camp, whereupon Mr. Turnage, assuming the rôle of deputy cook, decided to prepare it for dinner. After the rattler was skinned and cleaned slices were cooked with bacon and proved to be very toothsome. Subsequently it was found that rattlesnake meat shredded with potatoes is a grateful substitute for codfish.

The southern lap of the expedition in February and March, 1933, led from Tucson to the southern boundary of Sonora. To the right were the plains bordering the Gulf, far to the left were the foothills that culminate in the Sierra Madre range. The coast and the mountains slowly converge as one travels south, the rainfall becomes slightly greater, and the desert undergoes some profound changes, which it was the object of the expedition to examine.

The southern edge of the desert is also the northern edge of the tropics. As the valley of the Yaqui River is approached from the north, some of the characteristic features of the desert begin to wane, and the vegetation comes to have a number of touches suggestive of tropical jungles. The amount of bare ground between plants becomes less, for example, and the situations in which there is none become more numerous. The size of the tallest trees becomes greater. The number of kinds of plants that may be counted in a single spot is larger. While thorny trees and shrubs with small leaves are still predominant, there are occasional ones with leaves larger than any that are found in the pronounced deserts. The cacti of the open deserts rapidly wane and new shade-enduring species appear, playing a much less important rôle in the vegetation than do their congeners to the north.

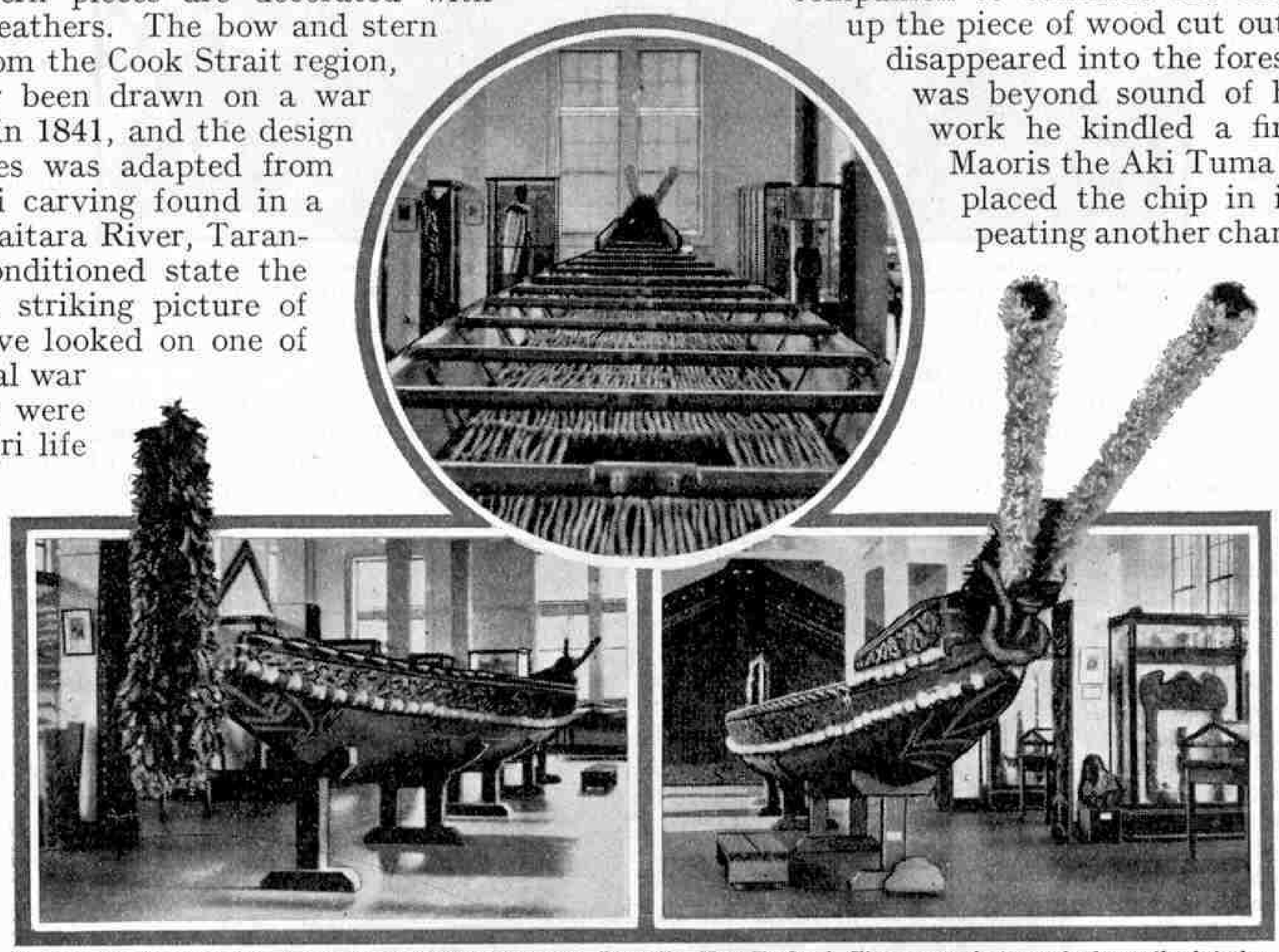
Camp life in the desert and in the tropics are two wholly different things. The transition in every aspect of nature is borne home to the camper in many ways that corroborate the conclusions reached through study of the vegetation. New kinds of ants are encountered in increasing hordes, with voracious appetites for everything from bacon to gummed labels. Termites begin work in a few hours on a plant press thoughtlessly left on the ground. A whole new fauna of (*Continued on page 67*)

The Building of a Maori War Canoe

Strange and Interesting Ceremonies

By R. R. C. MacLachlan

THE Otago University Museum at Dunedin, New Zealand, includes among its many interesting exhibits a fine Maori river canoe. The age of this canoe is not known, but it is believed to have been launched about 1880. The hull was obtained at Wanganui, in the Cook Strait region, in 1931, by the Association of Friends of the Museum, and was transported to the Museum, where it was reconditioned at a total cost of £225. The restored canoe is painted Indian red, and the bow and stern pieces are decorated with white albatross feathers. The bow and stern carvings came from the Cook Strait region, having originally been drawn on a war canoe at Nelson in 1841, and the design of the top-strakes was adapted from an ancient Maori carving found in a swamp on the Waitara River, Taranaki. In its reconditioned state the canoe presents a striking picture of how it would have looked on one of the frequent tribal war expeditions that were a feature of Maori life in New Zealand before the white settlers established law and order.



The Maori War Canoe in the Otago University Museum, Dunedin, New Zealand. The upper photograph shows the interior of the vessel, and the two lower photographs show respectively the stern and the bow decorated with turkey feathers.

The building of a Maori war canoe such as this exhibit was an interesting task, begun with strange ceremony. The canoe was shaped out of a single tree trunk, usually of totra or black pine, chosen with great care. If the selected tree was a long way from the pa, or village, the workmen removed with their wives and children to the vicinity of the tree, erected temporary huts, and established a work camp. In many cases a plot of ground near the camp was cleared and dug and a crop planted, to ensure a convenient and plentiful supply of food.

When everything was ready a tohunga, or priest, was consulted as to the correct day on which to commence felling the tree. In deciding this matter the priest took into consideration the current phase of the Moon, as the selection of an unfavourable day for beginning the work would certainly cause the finished canoe to capsize, or bring defeat upon the war party using it.

According to Maori mythology, trees are "tapu," or taboo, and must not be harmed. Before a tree was cut down, therefore, a quaint rite called Shi Purahan was performed. One of the workmen was chosen to carry out the ceremony, and early on the next morning he and a companion visited the tree. The chosen man then formed a representation of an adze by attaching a leaf to the end of a stick, and donned a girdle of leaves while he repeated a chant. He then grasped his imitation adze and struck the tree with it near its base, at the same time repeating another chant. When he reached the last sentence he struck a second blow at the tree, but this time with a real adze, and passing the tool to his companion to continue the chopping he picked up the piece of wood cut out by the blow and disappeared into the forest. As soon as he was beyond sound of his companion at work he kindled a fire, called by the Maoris the Aki Tuma Whenua fire, and placed the chip in it, meanwhile repeating another chant. This ritual and the chip were for the gods.

The man then returned to his companion, collected the chips of wood that had been cut out of the tree trunk during his absence, and burned them in a fire that he kindled near the tree. It was believed that this ritual removed the "tapu" from the tree. Finally a ceremonial feast was provided in which all the workers took part, and during it more rites, this time to impart strength and energy to the men, were performed by the priest.

Safeguarded by these religious precautions, the Maori workmen then concentrated upon the actual felling operations. The "lean" of the tree was ascertained, and two posts were driven into the ground on the side on which the tree would fall, and the width of it apart. Felling the tree solely by hand adzes would have been a very slow process, and additional devices were employed to speed up the work. One of these was a kind of ballista, the name given to a military weapon of the ancients that was in the form of a cross-bow and was used for hurling large stones, darts and arrows. In the Maori device a rope was attached at one end to the top of a sapling and at the other to a stone-headed, chisel-like implement running on rails. Several men hauled on the rope, bending the sapling to the required curve

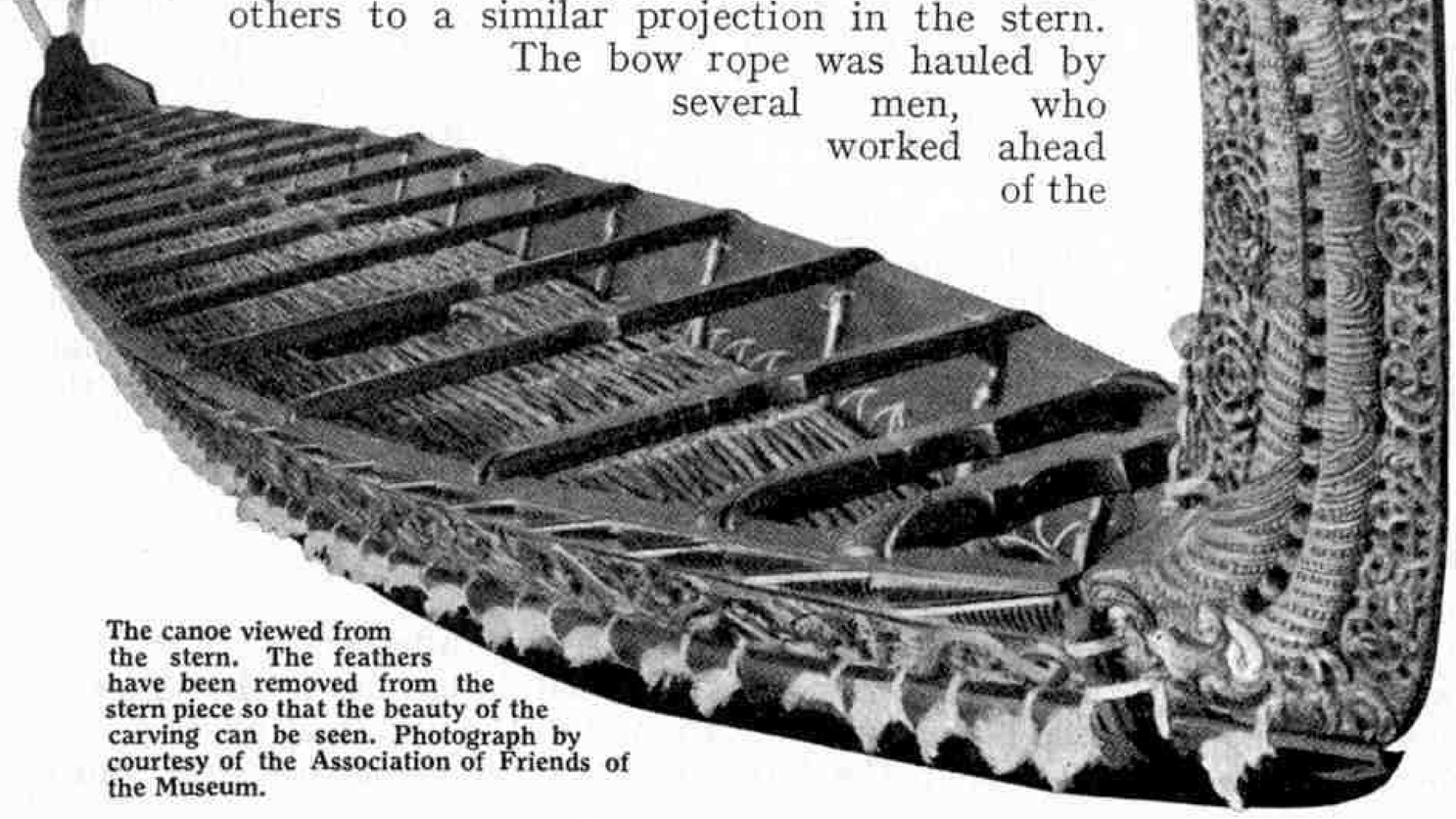
just as a bowman stretches his bow. The rope was then released, so that the tool was dashed with great force across the base of the tree. This operation was repeated many times, small hand adzes being used to clear away the wood smashed by the successive blows of the tool.

In another and more primitive method employed by some tribes a large stone adze was lashed to a heavy shaft attached by a rope to a bough half-way up the tree. Several men then swung the shaft backward and forward after the manner of a battering ram, so that the adze was repeatedly dashed against the tree. When the adze had cut a deep groove at the base of the trunk the shaft was raised a short distance and another groove was cut in the same manner. The wedge of wood between the two grooves was then chopped away with hand adzes.

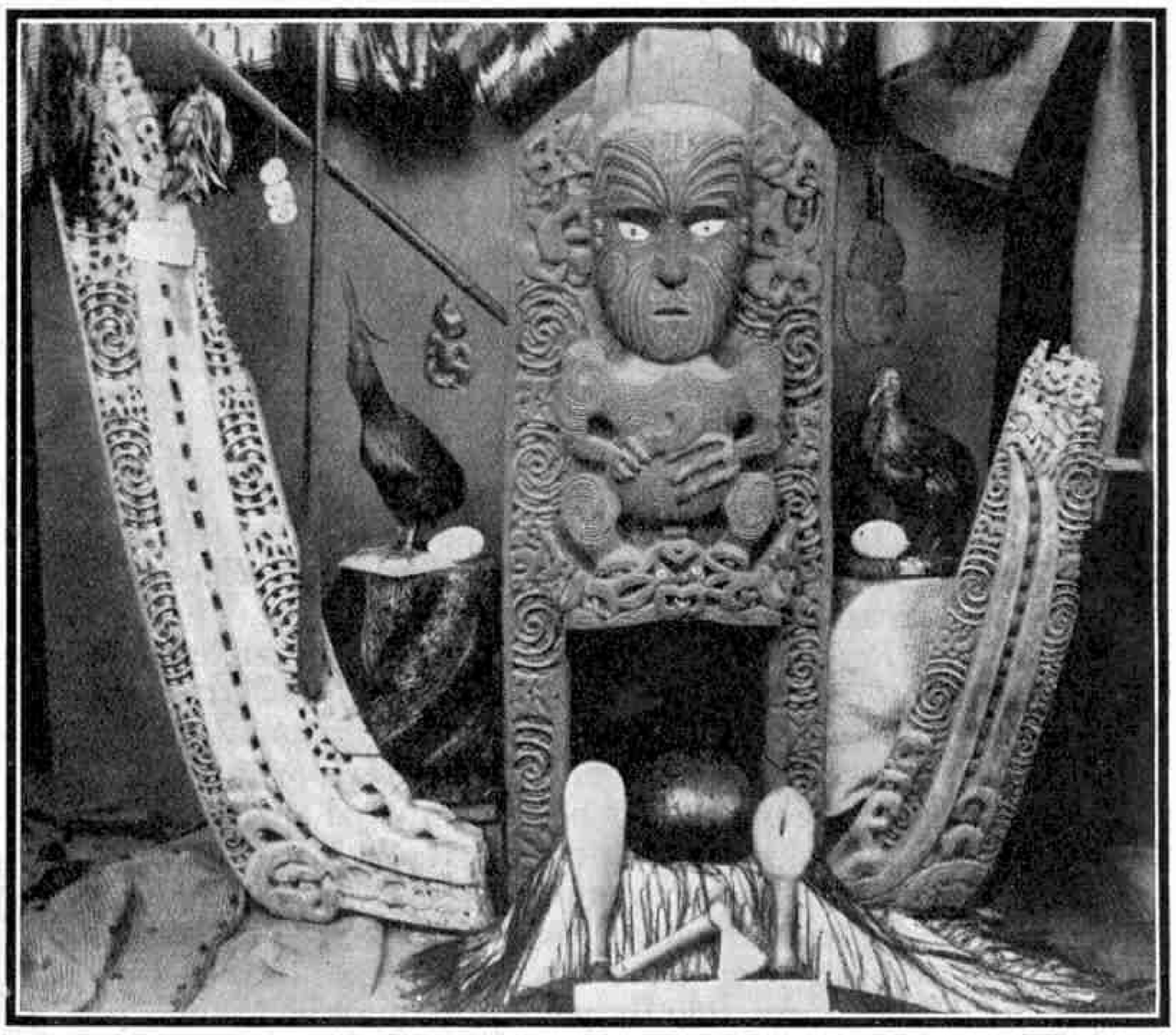
The felling of a tree usually occupied from two to three days, and the cutting off of the head another two to five days. When the tree had fallen the branches were lopped off, and the top of the tree was severed by a method consisting of alternate burning and chopping, leaving a log 50 ft. or more in length and from 5 ft. to 8 ft. thick.

The longer job of hollowing out the log to the approximate shape of the canoe was then commenced. The method employed was to kindle a row of fires along the log for the distance that the hollowed-out portion was to extend. These fires were allowed to burn for a little time, and were then removed. The charred wood was cut out by adzes, after which the fires were replaced and the process was repeated. The extent to which the hollowing-out was carried depended upon the distance that the canoe hull had to be transported to its final fitting-out base, for if too much wood were removed there was a danger that the hull would crack during transport. Experts, therefore, kept a constant watch over the process, and when they saw that the proper stage had been reached they stopped the further use of fires and the work was completed by adzing.

The transportation of the roughly-hollowed out hull to the fitting-out base was an arduous task. The base was situated on some river or lagoon, and a broad path was cut to it through the forest or shrub, and the cleared ground was levelled. Ropes about the thickness of a man's wrist, made of plaited leaves, were fastened to the hull, one rope to a wooden projection left for the purpose in the bow, and the others to a similar projection in the stern. The bow rope was hauled by several men, who worked ahead of the hull, and the stern ropes were hauled by men abreast of it. The hull was pulled forward over skids consisting of round pieces of wood of suitable length, and two groups of men were kept busy removing the skids over which the hull had passed, and placing them in position on the pathway ahead.



The canoe viewed from the stern. The feathers have been removed from the stern piece so that the beauty of the carving can be seen. Photograph by courtesy of the Association of Friends of the Museum.



An interesting photograph showing examples of Maori carving.

At the fitting-out base a rough shelter consisting of a roof set on piles was erected over the hull. The operations carried out there were considered to be very "tapu." The clothes worn by the workmen were kept on the spot until the work was completed, being put on and taken off in a shed erected for the purpose; and the tools used were also kept at the base. Only men were allowed to be spectators of the building of the canoe, and it was believed that if a woman passed over the spot where the work was in progress the gods would desert the canoe which, therefore, would be doomed to suffer misfortune.

The final adzing down of the hull to its proper lines was followed by fitting the two top-strakes upon the gunwales or upper edge of the vessel's sides, and after this operation came the fitting of the thwarts that provided the seats for the paddlers, and also served to strengthen the top-strakes. Next came the fitting of the bow and stern pieces, which were the most conspicuous parts of the boats. They were beautiful examples of Maori wood carving, which usually had taken months or even years to complete. The Maori carver did not work to any pre-arranged plan, but simply cut and bored with his small stone chisels and drills until his experienced eye told him that the proportions of his work were correct. Under these simple conditions he produced work of very high (*Continued on page 42*)

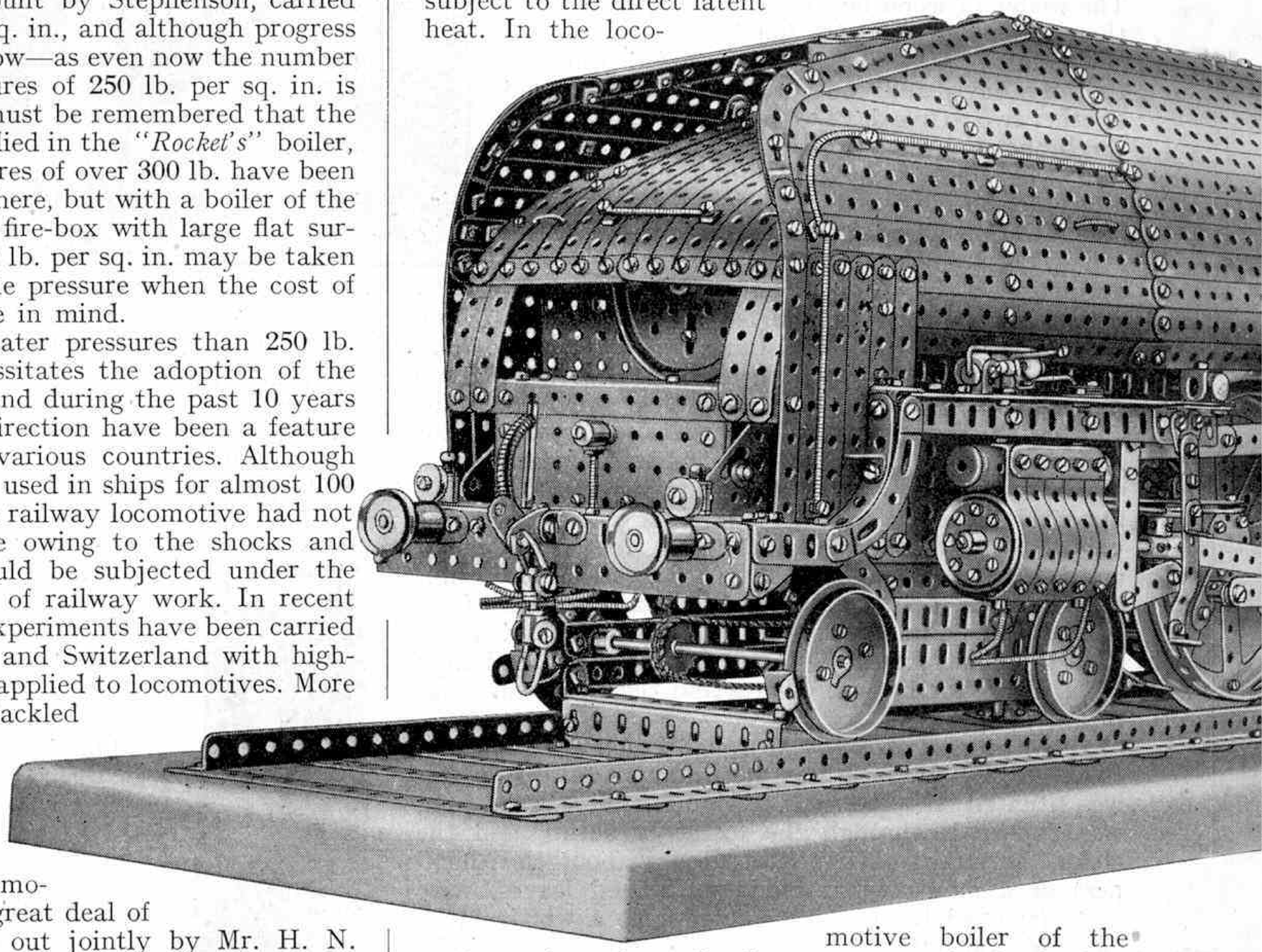
1 in. Scale Mecc
L.N.E.R. High-Pressure L

IN the comparatively early days of the locomotive it was recognised that, if the boiler pressure were increased, an economy in fuel consumption would be effected. With the ordinary type of locomotive boiler, however, such increases of pressure have generally resulted in increasing the cost of boiler maintenance. The boiler of the "*Rocket*," as built by Stephenson, carried a pressure of 50 lb. to the sq. in., and although progress may appear to have been slow—as even now the number of locomotives using pressures of 250 lb. per sq. in. is comparatively limited—it must be remembered that the fire-tube principle, as embodied in the "*Rocket's*" boiler, has been adhered to. Pressures of over 300 lb. have been tried in Germany and elsewhere, but with a boiler of the Stephenson type, having a fire-box with large flat surfaces that require stays, 250 lb. per sq. in. may be taken to be the highest practicable pressure when the cost of boiler maintenance is borne in mind.

The use of steam at greater pressures than 250 lb. per sq. in., therefore, necessitates the adoption of the water-tube type of boiler, and during the past 10 years or so experiments in this direction have been a feature of locomotive practice in various countries. Although this type of boiler has been used in ships for almost 100 years, its application to the railway locomotive had not been considered practicable owing to the shocks and vibrations to which it would be subjected under the relatively rough conditions of railway work. In recent years, however, numerous experiments have been carried out in America, Germany, and Switzerland with high-pressure water-tube boilers applied to locomotives. More recently the problem was tackled seriously in this country, and the first practical results took the form of the L.N.E.R. locomotive "No. 10000," which was completed in 1929. This locomotive was the outcome of a great deal of experimental work carried out jointly by Mr. H. N. Gresley, the Chief Mechanical Engineer of the L.N.E.R. and Mr. H. Yarrow of Glasgow, whose firm are famous as specialists in the design and building of water-tube boilers.

In "No. 10000" no revolutionary changes in design are embodied. The engine is of the four-cylinder compound type, the adoption of the compound principle being a necessity in order to take the fullest advantage of the high-pressure steam. The steam is supplied to the cylinders by a specially-constructed water-tube boiler designed jointly by Mr. Gresley and Mr. Yarrow, and built by the latter's firm. This boiler has given complete satisfaction, and it is interesting to note that at no point where the 768 tubes are expanded into the various drums has any sign of leakage occurred. In order to reduce scale formation in the boiler the feed-water is introduced at a temperature of over 400 deg. F. Boiler steam, before entering the high-pressure cylinders, is passed through superheating elements in the central flue that raise the temperature to approximately 700 deg. F.

It is remarkable that the boiler, although at no point in direct contact with the fire, is capable of supplying 20,000 lb. of steam per hour at a pressure of 450 lb. per sq. in. This notable rate of evaporation is possible owing to the large proportion of the heating surface that is subject to the direct latent heat. In the locomotive boiler of the ordinary fire-tube or Stephenson type, only the fire-box is subject to latent heat, and the rate of evaporation in the neighbourhood of the tubes is much below that near the fire-box sides. All the vital parts of the boiler and superheater are protected from direct heat by brick columns, thus ensuring a long life for these portions of the locomotive.



In order to avoid unnecessary complications, the steam used for auxiliary purposes is first passed through a reducing valve, which delivers it to a manifold in the cab at a pressure of 200 lb. per sq. in. It has thus been possible to retain standard fittings for all purposes except the main safety valve, regulators and the water gauges, which naturally are in direct communication with the boiler.

The most noticeable external difference between this locomotive and one of normal design lies in the shape of the boiler and the cab, and in the apparent absence of a chimney. The latter point, indeed, has been the cause

eccano Model of Locomotive "No. 10000"

of more popular comment than any other feature of the engine. In designing the boiler it was found necessary to provide extremely long water-tubes, which resulted in a boiler of high pitch, so that it was impossible to mount a chimney in the usual position. The difficulty was overcome by sinking the chimney within casing plates, the front end of the engine generally being so designed that the smoke and exhaust steam would be thrown upward for some distance and thus allow a clear view at all

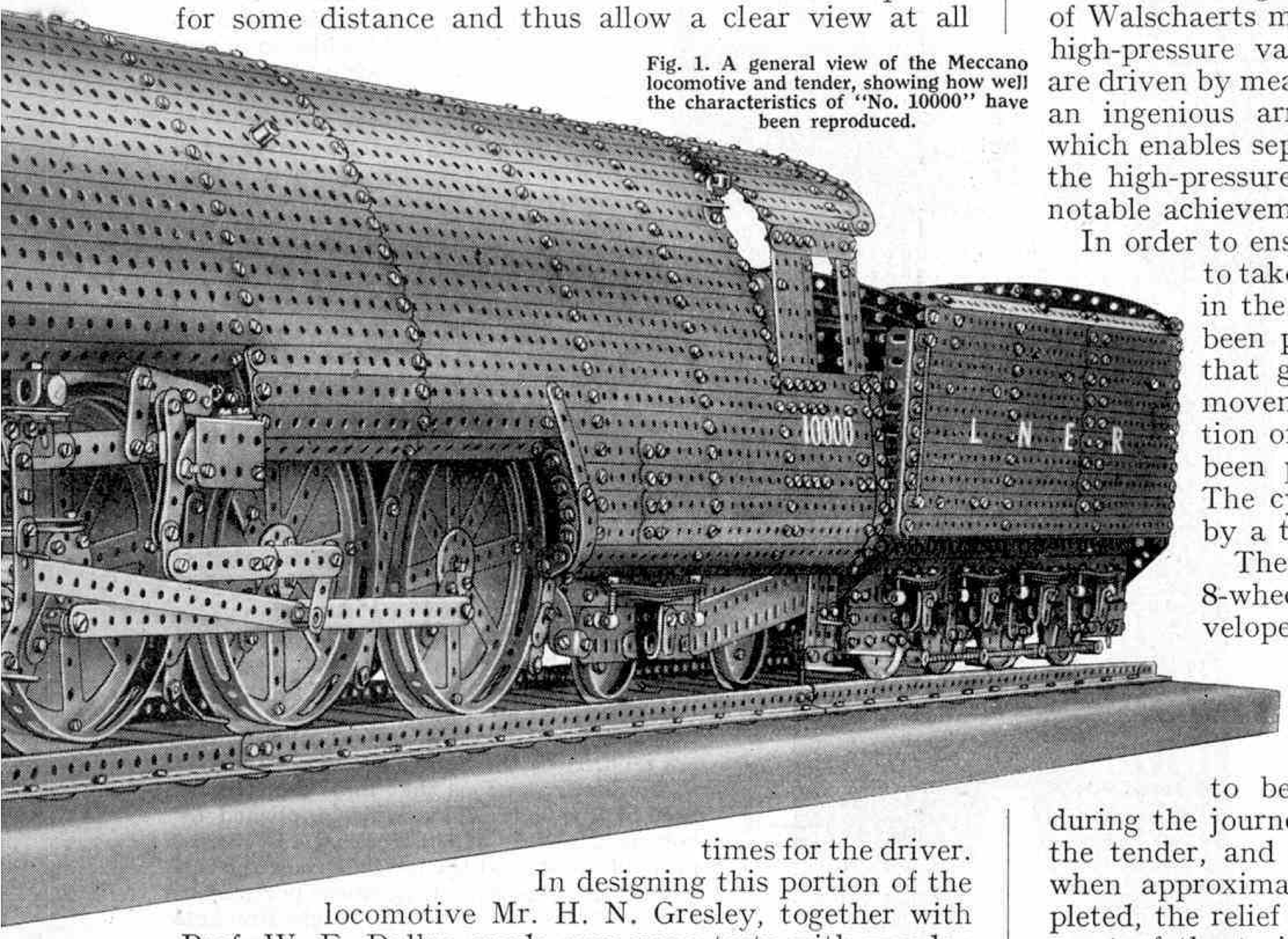


Fig. 1. A general view of the Meccano locomotive and tender, showing how well the characteristics of "No. 10000" have been reproduced.

times for the driver.

In designing this portion of the locomotive Mr. H. N. Gresley, together with Prof. W. E. Dalby, made numerous tests with wooden models of proposed designs. These were placed in a wind tunnel, and powdered chalk was projected through the chimney in place of smoke. The action of the chalk was noted with speeds up to 50 m.p.h., the observations being carried out through glass windows in the side of the tunnel. These tests ultimately resulted in the present design, where the streamlined chimney protrudes through a leading-up surface, which deflects the air stream in an upward direction. The air stream is further concentrated by means of the curved casing plates mentioned previously. The design has given complete satisfaction in actual service, sufficient upward deflection of the exhaust being obtained at all speeds without hindrance to the driver's view.

When the engine was originally built it was fitted with two high-pressure cylinders 12 in. in diameter, and two low-pressure cylinders 20 in. in diameter. After a period of running, however, it was decided that the work would be more equally distributed between the high-pressure and low-pressure units if a reduction in the diameter in the high-pressure cylinders were effected. This alteration was therefore carried out, and as was expected resulted in a more evenly balanced engine as a whole.

In order to secure the best results from compound locomotives it is desirable that separate control for the valve gears of the high-pressure and low-pressure cylinders should be afforded. Ordinarily in a 4-cylinder compound this would involve the provision of four separate sets of valve gear. It is interesting, however, that "No. 10000," although a 4-cylinder engine, has only two sets of Walschaerts motion operating directly on the outside high-pressure valve spindles. The low-pressure valves are driven by means of a special connection incorporating an ingenious arrangement patented by Mr. Gresley, which enables separate points of cut-off to be reached in the high-pressure and low-pressure cylinders, and is a notable achievement in design.

In order to ensure as delicate control as possible, and to take the fullest advantage of this refinement in the design of the motion, telemotors have been provided to operate the steam reverser that governs the reversing and notching-up movements. The reliability and ease in operation of control by telemotors have long since been proved in the steering gears of ships. The cylinder drain cocks are also controlled by a telemotor.

The locomotive is fitted with an L.N.E.R. 8-wheeled corridor tender of the type developed for the London to Edinburgh non-stop runs of *"The Flying Scotsman."* This carries sufficient coal for journeys of this length, and is provided with a scoop that enables the water supply to be replenished from the track troughs during the journey. The corridor runs down one side of the tender, and enables the enginemen to be changed when approximately half the journey has been completed, the relief crew travelling in the leading compartment of the train. The total weight of the engine and tender in working order is 166 tons so that "No. 10000" is one of the heaviest locomotives in this country.

Since its construction the engine has been used extensively on a number of long runs, taking its turn with the standard "Pacific" locomotives in the working of important expresses, including *"The Flying Scotsman."* The results obtained as regards reliability and economical fuel consumption appear to have been quite satisfactory, but a prolonged period of use will be necessary before economies in maintenance costs will become fully apparent.

With regard to the initial expense of construction, the forged steel drums in the boiler are the most expensive components. As these are not in any way subjected to the action of the fire, however, they may be expected to have a long life. The cost of this water-tube boiler is not greatly in excess of that of the usual "Pacific" type of boiler with wide fire-box. The fire-box of a normal locomotive is the most costly section, its life being short and its renewal expensive. The water-tube boiler, however, requires no copper fire-box or fire-box stays, so that

the costly maintenance and continual anxiety caused by fire-box stays are abolished. Again, the tubes are more effectively secured, and are not subjected to variation of temperature or stress where they enter the drums. With the reasonably high pressure adopted in this engine therefore, and the great care with which every part has been designed, the ultimate results should be favourable.

The Meccano Model

The model is built to a scale of slightly less than 1 in. to the foot, and is intended primarily as a model of instruction for demonstrating the general characteristics of this locomotive. For this purpose it has been raised slightly above a section of railway track, and matters have been so arranged that a Motor carried in the Tender drives all wheels at their correct speeds through Sprocket Chain. Thus it is possible to study the Walschaerts valve motion and to vary the valve travel, the latter operation being carried out from a lever in the cab. It is also possible to control the brakes from the tender platform, and to receive an excellent idea of the controls and method of operating the locomotive from the fittings in the cab.

Construction of the Boiler and Cab

Owing to the peculiar shape of the boiler, it is necessary to build it up in a rather unorthodox manner, the lack of a rigid and symmetrical framework making the construction far simpler than that of a standard locomotive boiler, if built in the following manner. Fig. 2 gives an excellent idea of the shape of the boiler and cab before being bent to shape.

The model is begun at the cab end. Three sets of three 12½″ Strips, laid side by side and bolted to suitable cross members 1, 2, 3, form what ultimately will be the top portion of the boiler. The three Strips at the cab end overlap the centre three Strips three holes, and the remaining three are overlapped two holes. Three more cross-members 4, 5, 6, are now bolted to the top of the boiler in the positions shown, and thirteen 4½″ Strips are secured to the member 4 on each side of the centre 12½″ Strips, in order to span the space between the members 4 and 1. Each 4½″ Strip, with the exception of the last one on each side, is now continued by two 12½″ Strips from member 1 across members 5, 2 and 6 to 3, and from here Strips of varying lengths are utilised to mould the front portion of the boiler.

A symmetrical finish is given to the ends of the Strips by clamping them between two 7½″ Strips, secured to the Flat Brackets 7, and two 3″ Curved Strips. A 7½″ Strip 12, overlapping the 12½″ Strip 13 two holes, is now fitted, and to this are bolted two further 7½″ Strips 14 by means of a Flat Bracket and 1½″ Strip. Each of the two extremities of the smoke deflector, built up from five 4½″ Strips and one 5½″ Strip, are bolted at their upper ends to the lower edge of the deflector proper, and at their lower ends to a 3½″ Angle Girder. A 1½″ Angle Girder 8 is bolted to one of the 4½″ Strips; the purpose of this will be described later.

Two 5½″ Strips 11, overlapping two holes at the member 2, are secured at one end to the member 6 and at the other by means of a Flat Bracket to the boiler. The edge of the member 6 is made to appear broader by fitting it with two Flat Brackets fixed in place by means of two ½″×½″ Angle Brackets.

The lower portion of the rear end of the boiler and the cab is now built. Two 9½″ Strips 9 are bolted between members 4 and 1 so that they overhang the member 4 ten holes. The inner ends of these Strips are extended to the member 6 by means of two 12½″ and two 5½″ Strips, and Strips of varying lengths are laid against 9 so that their ends form a slope at 5. The appearance of this slope is improved by fitting a 4½″ Strip and eight Flat Brackets, as shown in Fig. 1.

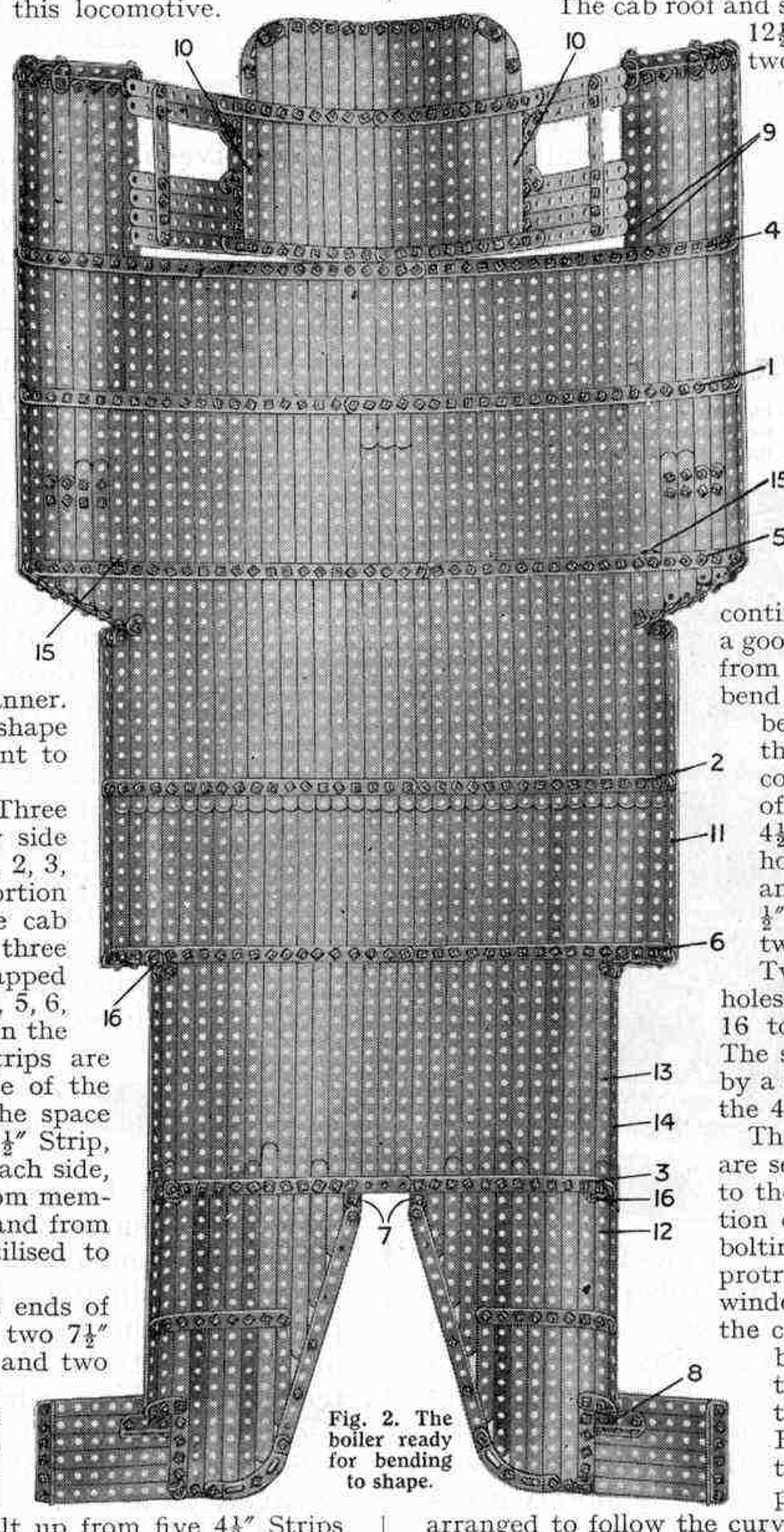


Fig. 2. The boiler ready for bending to shape.

The cab roof and sides are built out from the three centre 12½″ Strips, mentioned earlier, on two sets of two 5½″ Strips. The roof consists of fifteen 4½″ and two 5½″ Strips 10, eleven of the centre 4½″ Strips being extended by 3″ Strips and the remaining four by 2½″ Strips. A roof edging effect is given by fitting a 5½″ Strip and two 2½″ small radius Curved Strips round the edge of the finished roof.

The cab window surroundings consist of a number of 4½″ Strips bolted together as shown in the illustration. A finished appearance is given to these windows by the addition of two Flat Brackets, one being fitted across each upper corner.

The bending of the structure to shape is commenced by curving the roof of the cab, the shape of which must be that of a wide angle, slightly rounded at the apex, rather than a continuous curve. The boiler is now curved, a good idea of the correct shape being gained from Fig. 1. It will be found advisable to bend the lower edges of the boiler and cab before finally drawing them together, as this method reduces possible damage to coloured parts to a minimum. The shape of the boiler is preserved by bolting two 4½″×2½″ Flat Plates, overlapping five holes, between the 1½″ Angle Girders 8, and by connecting together the two ½″×½″ Angle Brackets 15 by means of two 4½″ Strips, overlapping two holes. Two further 4½″ Strips, overlapping five holes, are bolted to the ½″×½″ Angle Brackets 16 to aid in strengthening the structure. The smoke-box door (Fig. 1) is represented by a 3″ Pulley Wheel secured by ⅜″ Bolts to the 4½″×2½″ Flat Plates mentioned earlier.

The upper portions of the cab sides, which are secured to the cab roof, are now bolted to the lower portions that form a continuation of the boiler. This is accomplished by bolting the ends of the vertical 4½″ Strips, protruding beyond the lower edge of the cab windows, to the top of the lower portions of the cab sides. Three ½″×½″ Angle Brackets bent to an angle of 45 degrees are fixed to each of the rear edges of the cab and these carry a 2½″ Strip and three Flat Brackets. The 2½″ Strip is attached to the Angle Brackets by Handrail Supports, and the three Flat Brackets are arranged to follow the curve of the lower portion of the cab. The Handrail Supports are fitted with handrails consisting of Spring Cord, down the centre of which has been passed 22 S.W.G. bare copper wire. The wire strengthens the rail and allows a firm grip to be obtained in the Handrail Support.

The whistle is built up from a Threaded Pin carried on a ½″×½″ Angle Bracket. The Threaded Pin carries a Compression Spring and three Washers held in place by a Collar. (*To be continued.*)

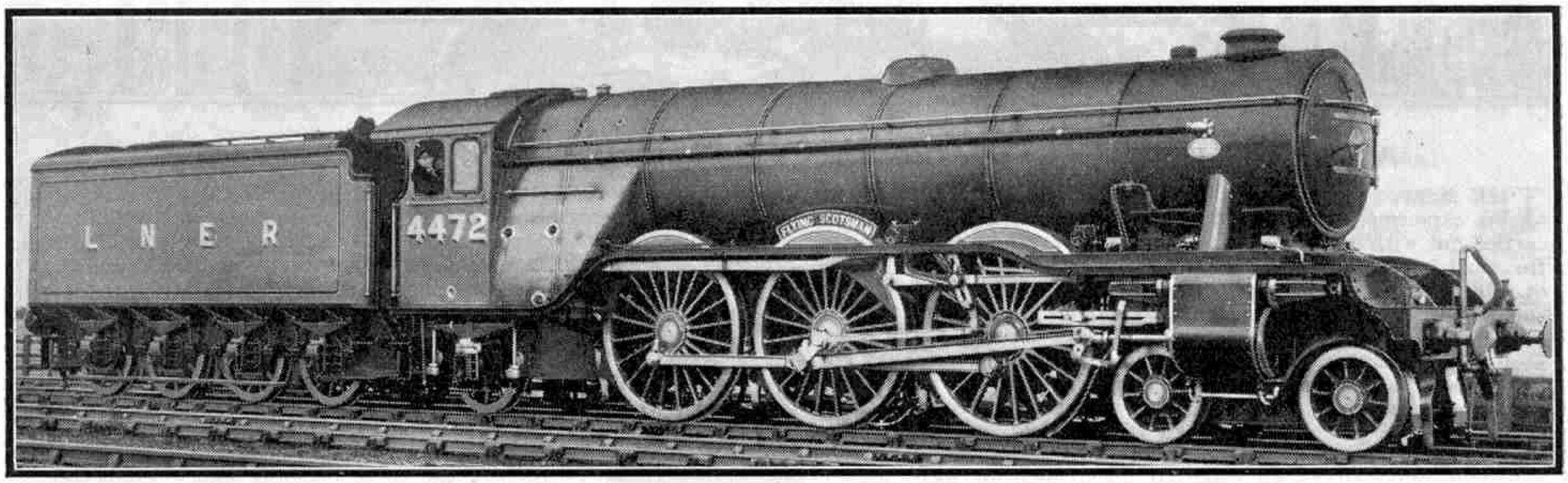
LIST OF PARTS REQUIRED

89	of No.	1	1	of No.	8a	29	of No.	12b	4	of No.	21	4	of No.	48b	11	of No.	64	20	of No.	90	10	of No.	103k	2	of No.	128
41	„ „	1a	12	„ „	8b	8	„ „	13a	4	„ „	22	2	„ „	48c	2	„ „	67	4	„ „	90a	8	„ „	109	12	„ „	133
86	„ „	1b	13	„ „	9	8	„ „	14	2	„ „	22a	4	„ „	50a	72	„ „	68	4	„ „	94	18	„ „	111	26	„ „	136
76	„ „	2	16	„ „	9a	8	„ „	16	4	„ „	23	10	„ „	52c	40	„ „	69	3	„ „	95	21	„ „	111a	8	„ „	137
98	„ „	2a	5	„ „	9b	2	„ „	16a	8	„ „	24	9	„ „	53a	17	„ „	70	14	„ „	96	71	„ „	111c	6	„ „	146
47	„ „	3	4	„ „	9c	1	„ „	16b	74	„ „	25	2	„ „	58	3	„ „	72	8	„ „	103	2	„ „	114	11	„ „	147b
47	„ „	4	6	„ „	9d	1	„ „	17	2	„ „	35	33	„ „	59	6	„ „	77	2	„ „	103a	2	„ „	116a	2	„ „	161
72	„ „	5	8	„ „	9e	5	„ „	18a	1474	„ „	37	8	„ „	62	8	„ „	79	4	„ „	103b	6	„ „	118	1	„ „	162a
16	„ „	6	11	„ „	9f	6	„ „	18b	240	„ „	37a	1	„ „	62a	1	„ „	79a	2	„ „	103c	2	„ „	119	4	„ „	163
46	„ „	6a	107	„ „	10	4	„ „	19	192	„ „	38	36	„ „	62b	1	„ „	80a	1	„ „	103d	7	„ „	120a	11	„ „	164
10	„ „	7	11	„ „	11	3	„ „	19s	1	„ „	43	18	„ „	63	3	„ „	81	11	„ „	103f	3	„ „	125	1	„ „	166
6	„ „	7a	97	„ „	12	9	„ „	19b	10	„ „	48	2	„ „	63b	1	„ „	82	6	„ „	103g	4	„ „	126	1	„ „	168a
7	„ „	8	6	„ „	12a	6	„ „	20b	6	„ „	48a	8	„ „	63c	6	„ „	89a	8	„ „	103h	6	„ „	126a	1	„ „	171
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New Speed Records on the L.N.E.R.

100 m.p.h. by "Flying Scotsman" Locomotive

By "Observer"



SPEED records of quite a sensational nature were achieved on Friday, 30th November last, when the L.N.E.R. made two experimental runs—from London (King's Cross) to Leeds, and back from Leeds to London. On the down journey the 185.7 miles were covered non-stop in 2 hr. 31 min. 56 sec., at an average speed of 73.4 m.p.h., while on the return trip, with an increased load, 5 min. more were taken, the average speed being 71 m.p.h. Over the 371.4 miles of the double journey the average speed was 72.2 m.p.h. The fastest regular train between King's Cross and Leeds is the *"Queen of Scots"* Pullman, which performs the journey in 3 hr. 13 min.; so that the outward run of the special train beat the best regular run by 41 min.

The locomotive responsible for these remarkable exploits was the famous Gresley "Pacific" No. 4472, *"Flying Scotsman."* In the down direction the train consisted of a dynamometer car, a first-class corridor coach, a dining car and a brake van, weighing altogether 147 tons. For the up journey two more coaches were added, bringing the load up to 207 tons.

The photograph above, reproduced by the courtesy of the L.N.E.R., shows No. 4472 "Flying Scotsman," probably the best known locomotive of its class. The records described on this page are in keeping with its already distinguished career. It was exhibited at the British Empire Exhibition at Wembley in 1924 and 1925, and was the first engine to make the London to Edinburgh non-stop run in 1928.

The demonstration was made as an answer to the challenge of the German Diesel-electric *"Flying Hamburger"* train that makes the run between Berlin and Hamburg, a distance of 178 miles, in 138 min. The special schedule adopted was actually suggested by the German railway authorities at the request of the L.N.E.R., and the timings set were those judged suitable for a *"Flying Hamburger"* service between London and Leeds. That schedule, which allowed 2 hr. 45 min. for the journey in each direction, requiring a speed of just under 70 m.p.h., was improved on by 13 min. in the down direction and by 8 min. in the up.

The details of the running show some astonishing features. King's Cross was left at 9.8 a.m. and Hatfield (17½ miles) was passed in 17 min. although the line is on the up grade almost all the way for the 12½ miles from the start to Potter's Bar. On the favourable stretch between Hitchin and Huntingdon travelling became exceedingly swift and a maximum of 94½ m.p.h. was reached. Peterborough (76¼ miles) was passed in the phenomenal time of 60 min. 39 sec. from King's Cross On the rising grades beyond, the running was astounding in its brilliance, and what was probably the most amazing feat of the day was accomplished by covering the 10 miles of decidedly adverse grades—averaging 1 in 200—from beyond Essendine to Stoke summit box at an average speed of 82½ m p.h. So far from being "winded" by the long climb to the summit, *"Flying Scotsman"* went over the top at 81 m.p.h. Grantham (105½ miles) was passed in 83½ min. and Doncaster (156¼ miles) in 122½ min., the speed to this point having averaged 77 m.p.h. Over the difficult, heavily-graded road beyond Doncaster, the running had to be somewhat restrained, while for the final 10 mile stage from Wakefield to Leeds, a speed limit of 45 m.p.h. had to be observed, so reducing the overall average.

The return journey was commenced at 2 p.m., and although, owing to the increased load and a severe p.w. check to 40 m.p.h. at Sandy, the time taken was longer by 5 min. and the average speed correspondingly lower, it was none the less of a record-breaking character, and in the course of it the highest speed of the day was attained. Owing to a reduction of speed in passing Grantham, and the stiff bank that follows, Stoke box was passed at 68 m.p.h., but down the falling grades beyond acceleration was astonishingly rapid, and the speed rose steadily until 90 m.p.h. was reached. Even then it still continued to soar until ultimately near Little Bytham the stop-watch timing recorded a rate of 98 m.p.h. For 3½ miles an average of 97.3 m.p.h. was sustained.

These, it would seem, are the highest fully authenticated speeds ever attained on British railways. The long-credited 102 m.p.h. record of the G.W.R. locomotive *"City of Truro"* has recently been subjected to a searching analysis in the *"Railway Magazine,"* by which it has been well-nigh proved that a mistake was made in the timing and that so high a speed was not achieved. Of the accuracy of the speeds of *"Flying Scotsman"* there can be no doubt. In addition to the records that were taken in the dynamometer car, the running was timed with meticulous care by Mr. Cecil J. Allen, the most expert of train timers.

The L.N.E.R. state that subsequent examination of the dynamometer car records has shown that the experimental train actually attained the magic rate of 100 m.p.h., and maintained this over a distance of 600 yds. near Little Bytham station. For the first time therefore in steam locomotive history the claim to reach a speed of 100 m.p.h. has been supported by the precise and authentic records of the dynamometer car.

The G.W.R. *"Cheltenham Flyer"* still holds the unbeaten record, made on 6th June, 1932, for a steam-drawn train, with a start-to-stop run from Swindon to Paddington at 81.6 m.p.h., but that was for a distance of only 77¼ miles and over a very easy road. The L.N.E.R. runs were for much longer distances, over a decidedly more difficult route, and far surpassed anything accomplished previously. In the course of that wonderful day no less than 250 miles were run at an average speed of 80 m.p.h., and 40 miles at an average of 90.

Mr. Gresley's splendid engine has certainly made new records and demonstrated that coal can still hold its own against oil in railway traction. It has shown conclusively that great accelerations are possible in British railway services.

The special train was in charge of Mr. V. M. Barrington Ward, superintendent Western Section, and the driver in both directions was the renowned Sparshatt of King's Cross depot. His driving was supremely able and he was competently aided by Fireman Webster, who during the double journey had to shovel 9 tons of coal from the tender to the fire-box.

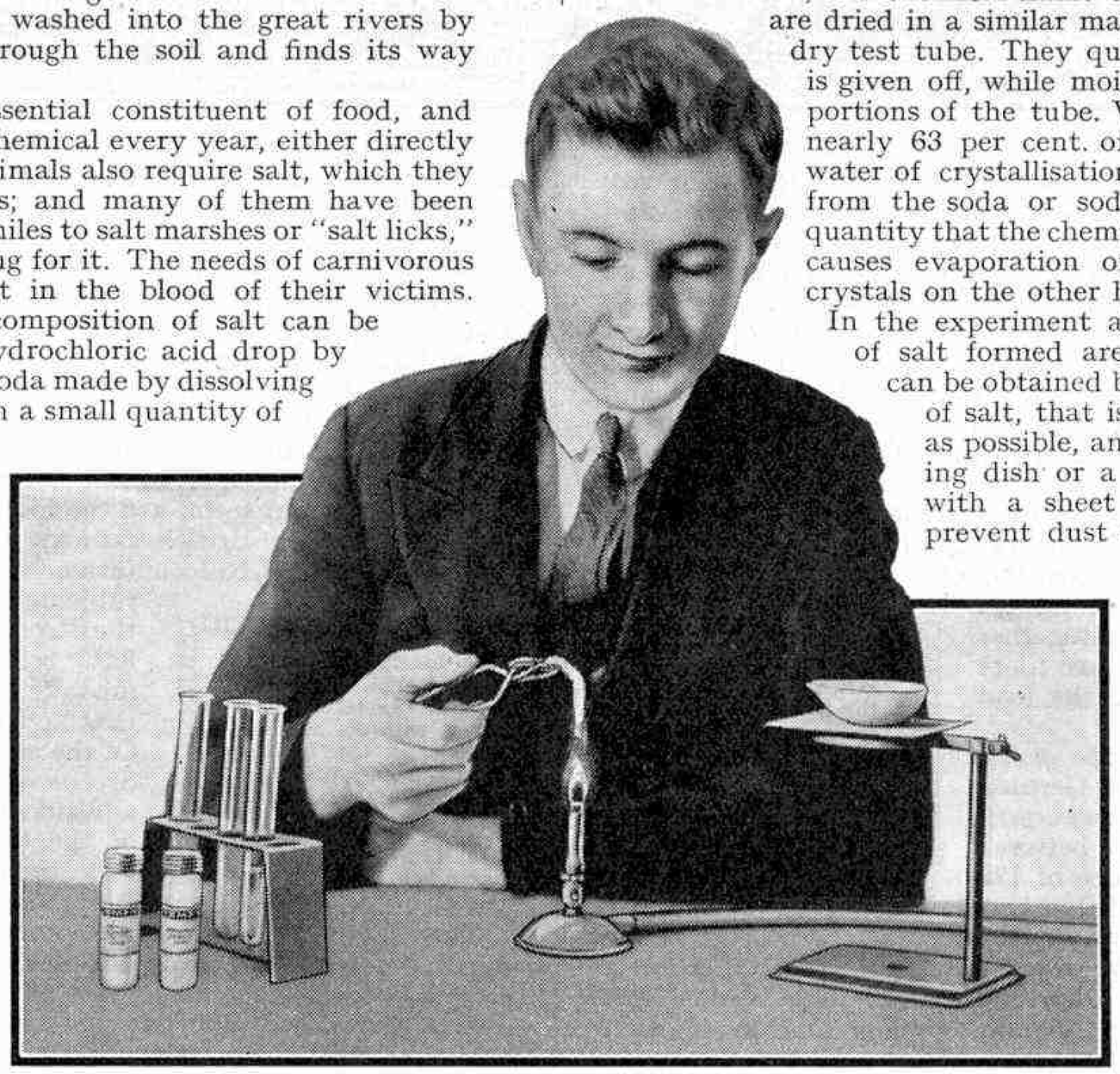


ATTRACTIVE EXPERIMENTS WITH HOUSEHOLD CHEMICALS

THE Kemex experimenter has not far to look for subjects for his experiments, and attractive and interesting work can be carried out with materials to be found in every household. One of the most important of these is common salt, the chemical name of which is sodium chloride. There is no substance that is so common or so well known as this. Immense quantities of it are found in huge deposits in mines in all parts of the world, and it has been calculated that there are 144 billion tons in the oceans. The quantity of salt in the seas is being increased at the rate of 160 million tons a year, for it is washed into the great rivers by the water that percolates through the soil and finds its way into their tributaries.

Salt is regarded as an essential constituent of food, and each of us uses 29 lb. of the chemical every year, either directly or indirectly. Plant-eating animals also require salt, which they obtain from grass and leaves; and many of them have been known to travel hundreds of miles to salt marshes or "salt licks," in order to satisfy their craving for it. The needs of carnivorous animals are met by the salt in the blood of their victims.

A proof of the chemical composition of salt can be obtained by adding dilute hydrochloric acid drop by drop to a solution of washing soda made by dissolving a teaspoonful of the crystals in a small quantity of water. There is a violent effervescence, owing to the production of carbon dioxide, and the addition of the acid is continued until no more bubbling takes place as each drop is added. If the liquid is evaporated to dryness, a white solid is produced that has the taste of salt. It is in fact sodium chloride, and chemically is exactly the same as the common salt used in our homes and in many manufacturing processes, which is obtained from mines in Cheshire and elsewhere, as explained in the article on "*The Romance of Salt*" that appeared in last month's issue of the "*M.M.*"



Heating a piece of asbestos that has been dipped in brine. A weird yellow light is produced.

Interesting and unusual experiments in crystallisation can be made with salt. Most soluble substances are less soluble in cold water than at higher temperatures. The usual plan when preparing crystals of one of them is to dissolve as much of it as possible in hot water and to allow the solution to cool, when the proportion that can no longer be held in solution separates out in crystalline form. Salt is very little more soluble in hot water than in cold, however, and a slight variation in the process therefore is necessary. As much salt as possible is dissolved in half a test tube full of hot water. Any salt remaining undissolved is then allowed to settle to the bottom of the tube and the liquid above it is poured into an evaporating dish. This dish is placed on the evaporating stand, with the lighted spirit lamp or bunsen burner beneath it, and evaporated with the aid of a small flame. As water is driven off in the form of steam, crystals of salt begin to separate out, usually in the form of a film on the surface of the liquid; and the evaporation is continued until most of the salt has separated from the solution.

The crystals obtained in this manner are small and can be used to show one of the peculiarities of this chemical. They are carefully dried by spreading them on a sheet of blotting paper, transferring them to a second sheet if the first becomes too wet, and leaving them in a warm place for a time. A test tube is then carefully dried, also by keeping it in a warm position after wiping the inside with a dry cloth. The dry crystals of salt are placed in this tube and gently heated, and they crackle and break up, but no moisture is to be seen in the test tube.

As a contrast to this experiment small crystals of washing soda, the chemical name of which is sodium carbonate, are dried in a similar manner, and heated in a perfectly dry test tube. They quickly form a liquid and steam is given off, while moisture condenses on the colder portions of the tube. Washing soda crystals contain nearly 63 per cent. of water, and on heating, this water of crystallisation, as it is called, is separated from the soda or sodium carbonate itself in such quantity that the chemical dissolves in it, and heating causes evaporation of some of this water. Salt crystals on the other hand contain no water.

In the experiment already described the crystals of salt formed are very small. Larger crystals can be obtained by making a saturated solution of salt, that is one containing as much salt as possible, and leaving this in an evaporating dish or a small saucer loosely covered with a sheet of filter paper in order to prevent dust from getting into the liquid. The water then evaporates slowly and the salt that can no longer be held in solution separates out in crystalline form. Slow evaporation at low temperatures in this manner always gives larger crystals than when a liquid is evaporated rapidly at high temperatures. In the present case the crystals should be large enough to enable their form to be recognised, especially with the aid of a magnifying glass.

Salt crystals are cubical in shape. This can be seen when rock salt is examined, although the individual crystals may not be complete, for a mass of rock salt consists of a large number of crystal growths adhering to each other. In this case the crystals are very large, because they were produced by very slow evaporation at ordinary temperatures, and the crystals remained for long periods in contact with saturated brine, or salt solution, and thus had time to "grow." Further quantities of salt separating from the brine were then deposited on the crystals already formed, and made them larger while preserving the outlines of their formation. The brown colour usually seen in rock salt is due to earthy impurities, as explained in the article on salt in last month's "*M.M.*"; but occasionally masses of pure white crystalline salt are found in salt mines.

A particularly curious and attractive experiment that can be made with salt is shown in the upper illustration on the opposite page. A piece of fairly thick string is left for a day or so in a saturated solution of salt, preferably one in which a little undissolved salt remains at the bottom of the liquid. The string is then removed from the solution and allowed to dry slowly, after which it is fastened to any convenient support—the Kemex

universal stand is shown in use for this purpose in our illustration—and a small weight is attached to it. A lighted match is then applied to the string. This burns, but the weight remains suspended, the string having been replaced by a column of salt held together by the fibres within it that have been protected from the flame.

The metal that is one of the constituents of salt is known as sodium. Unlike iron, copper and other metals with which most of us are familiar, this metal is so soft that it can be cut with a knife. An ordinary piece of sodium does not look at all like a metal, but the reason for this is seen on cutting a fresh surface, which has the usual metallic glitter, but quickly becomes dull and tarnished because it is acted upon chemically by the moisture in the air to form caustic soda. Sodium in fact is so eager to take up water that a violent action occurs when a piece of the metal is thrown into a basin containing that liquid, and so much heat is produced that the metal melts into a little round globule that runs backward and forward over the surface, leaving behind it a trail of tiny bubbles of hydrogen displaced from the water. The metal often is protected from the action of the moisture in the atmosphere by storing it in bottles filled with paraffin.

Many common substances contain sodium, among them salt, borax and soda, and the compounds of the metal are so widespread that they can be detected in practically every particle of dust. How this can be done is explained by a simple experiment. A piece of asbestos fibre is thoroughly soaked in a saturated salt solution and is then allowed to dry. One end of it is held in the test tube holder, or in a small pair of tongs, so that the other end is in the upper part of the flame of the bunsen burner or spirit lamp. A certain amount of spluttering takes place owing to the effect of heat on the salt crystals, and the flame assumes a yellow colour that gives a ghastly appearance to the face and hands of those who are near it.

The colour given to a flame by a sodium compound is best seen when the experiment is carried on in darkness, and a good plan is to cover a teaspoonful of fine dry salt, placed in an evaporating basin or small dish, with methylated spirit similar to that used in the spirit lamp. The dish is warmed and the methylated spirit is ignited, and the blue flame first obtained is quickly transformed into the characteristic yellow flame that shows the presence of salt or of some other compound containing the metal sodium.

Similar experiments with Strontium Nitrate in place of salt yields a bright crimson flame. A brick red flame is obtained if a salt of calcium is used. A suitable calcium compound is prepared by dissolving a few measures of Calcium Oxide (Lime) or Calcium Carbonate (Marble) in dilute hydrochloric acid and evaporating the solution to dryness.

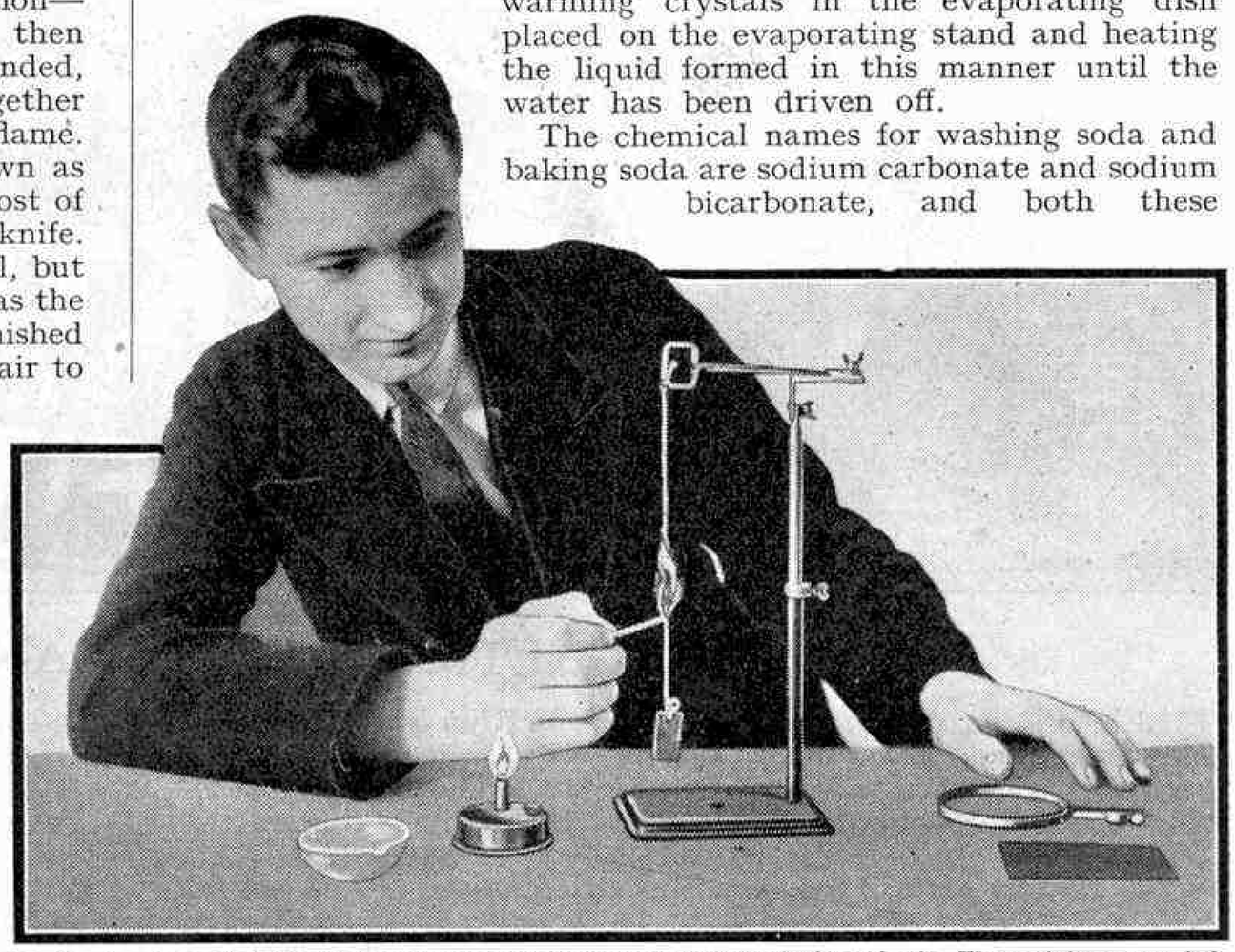
Experimenters will be interested to know that the yellow light characteristic of sodium and that emitted by calcium compounds can be detected in the rays of the Sun. The colours become apparent when sunlight is spread out into a spectrum by means of prisms in the instrument known as the spectroscope, and their occurrence in the solar spectrum is a proof of the existence of sodium and calcium in the Sun.



A chemical gun in action. The cork is blown out of the bottle by gas pressure.

Washing soda and baking powder are interesting chemicals that contain the metal sodium, and its presence in them can be shown by flame tests similar to those already described in the case of salt. In the case of washing soda, it is advisable to get rid of the water of crystallisation before trying the experiment with methylated spirit, and this of course can readily be accomplished by simply warming crystals in the evaporating dish placed on the evaporating stand and heating the liquid formed in this manner until the water has been driven off.

The chemical names for washing soda and baking soda are sodium carbonate and sodium bicarbonate, and both these substances are manufactured on an enormous scale from the salt that is produced in Cheshire and elsewhere. The processes by which it is obtained are too long and complicated to follow by means of simple experiments. The first to be introduced was known as the Leblanc process, after its inventor, a Frenchman who lived in the Napoleonic era. A scarcity of saltpetre, another compound of sodium that is one of the constituents of gunpowder, then led to the offer of a large prize by the French Government for means of manufacturing this chemical from salt. Leblanc tried to win this prize, and in his experiments discovered a way of making soda from salt. This proved to be of wonderful commercial value, but it was not generally adopted until many years later and it is sad to learn that Leblanc himself died in poverty.



Igniting a piece of string that has been soaked in a saturated solution of salt. The weight suspended by the string does not fall when this burns away.

Leblanc's process has now been largely replaced by a more efficient one that produces sodium bicarbonate, from which sodium carbonate is easily made by heating. This change can be followed experimentally by heating sodium bicarbonate in a dry test tube. Moisture is given off and if the tube is held nearly horizontally while the bicarbonate is being heated, and its mouth is placed over a vertical test tube containing a few drops of lime water, the latter is turned milky. This shows that the gas carbon dioxide is driven off along with the water.

Another way of obtaining carbon dioxide from sodium bicarbonate or baking powder is by the action of an acid. Solutions of baking soda and Tartaric Acid are made by dissolving in each case six measures of the chemical in a third of a test tube full of water. There is a violent effervescence when the solution of Tartaric Acid is poured into that containing baking soda. The gas produced is carbon dioxide, and as this is heavier than air it can be poured downward into a second test tube containing lime water, which of course is then turned milky. The substances included in a Seidlitz Powder contain this bicarbonate and Tartaric Acid and our experiment explains what happens when the two are mixed together in water. Sodium Tartrate is produced at the same time and this new chemical can be obtained from the solution by evaporation to crystallising point.

An amusing way of demonstrating the action of Tartaric Acid on bicarbonate of soda is shown in the lower illustration on this page. A teaspoonful of baking soda is placed in a soda-water or lemonade bottle, similar to that shown in our photograph. The bottle is about one-third filled with water, in which the bicarbonate is dissolved, and is then laid on its side. A teaspoonful of Tartaric Acid is crushed to powder and wrapped in paper, and a wire is attached to the small packet, which is pushed into the bottle so that it remains in the space above the liquid. The wire is bent if necessary, so that the packet remains in position when the bottle is corked. Care should be taken that the cork seals the space within the bottle, but is not so tight that a great effort is required to pull it out.

This completes the preparations. When the bottle is rolled over, the paper packet is brought into contact with the liquid, which rapidly soaks it through and thus gains access to the Tartaric Acid. The violent action that follows produces carbon dioxide in such quantities that the pressure inside the bottle rises rapidly and the cork is blown out.



A MAGNETIC QUESTION AND ANSWER DEVICE

ELEKTRON experimenters can obtain much fun from a magnetic question and answer device that is easily made from Elektron parts and additional materials that are available in every household, and in this article we explain how the device is constructed and used.

The working parts of the apparatus are contained in a cardboard box, or in one of thin wood over which paper is gummed. The box should be square and one with a side of 5 in. and a depth of about $\frac{3}{4}$ in. is of convenient size, and it should have a deep-fitting lid. A white box is better than a coloured box, but is not essential, for white paper covers can be gummed over it where necessary in order to make the questions and answers readily visible when written or printed in black ink. Those who wish to give as mysterious an appearance as possible to the device of course can make use of any contrasting colours that will make the questions and answers readable.

Place the lid on one side for a time and find the centre of the bottom of the box by drawing straight lines from corner to corner. Then place the Compass Mount and Pivot so that its point is directly above the centre and fix it firmly in position by means of strips of gummed paper passing over it. An arrow 3 in. in overall length is then cut from stiff paper. Its shaft should be as wide as the Compass Needle and it should have a well-defined head, for this points to the answer when the device is in working order. It is gummed to the upper side of the Compass Needle after a small hole has been made in it to admit the brass projection that forms the top of the cup on which the Needle is balanced. With its paper load, the Compass Needle should balance itself in a horizontal position when placed on the Compass Pivot, and if necessary the opposite end of the arrow to the point should be slightly trimmed with a pair of scissors in order to achieve this.

The centre of the top of the lid of the box is then found, as in the case of the box itself, by drawing diagonals. With the point of the Intersection of these as centre, three circles are drawn on the lid. These can conveniently have radii of 1 in., $1\frac{1}{2}$ in., and $2\frac{1}{2}$ in. respectively, and of course the largest of the three circles just touches the sides of the lid. Between the first and second circles segments are cut out carefully with a sharp penknife, as shown in the accompanying illustrations. The purpose of the openings made in this manner is to enable the movements of the answering arrow to be readily followed, and the portion of the lid left in the centre serves as a support for the questioning disc.

The space between the second and third circles is then divided into sections by drawing diagonals. The most convenient number of sections is eight and the accompanying photographs show exactly how this division is carried out. Finally an arrow pointing directly towards the centre is drawn outside the third circle in one corner of the box.

The next requirement is the questioning disc. This should be as large as possible in order to allow space for writing the questions on it, but must not completely cover the openings cut in the lid of the box through which the answering arrow is seen. A disc $1\frac{1}{8}$ in. in radius is of convenient size, and a circle of this radius is drawn on a sheet of card similar to that of which the box is made. A second circle of $\frac{1}{2}$ in. radius is drawn at the same time, and the space between the two circles is divided into the same number of segments as were arranged on the lid of the box.

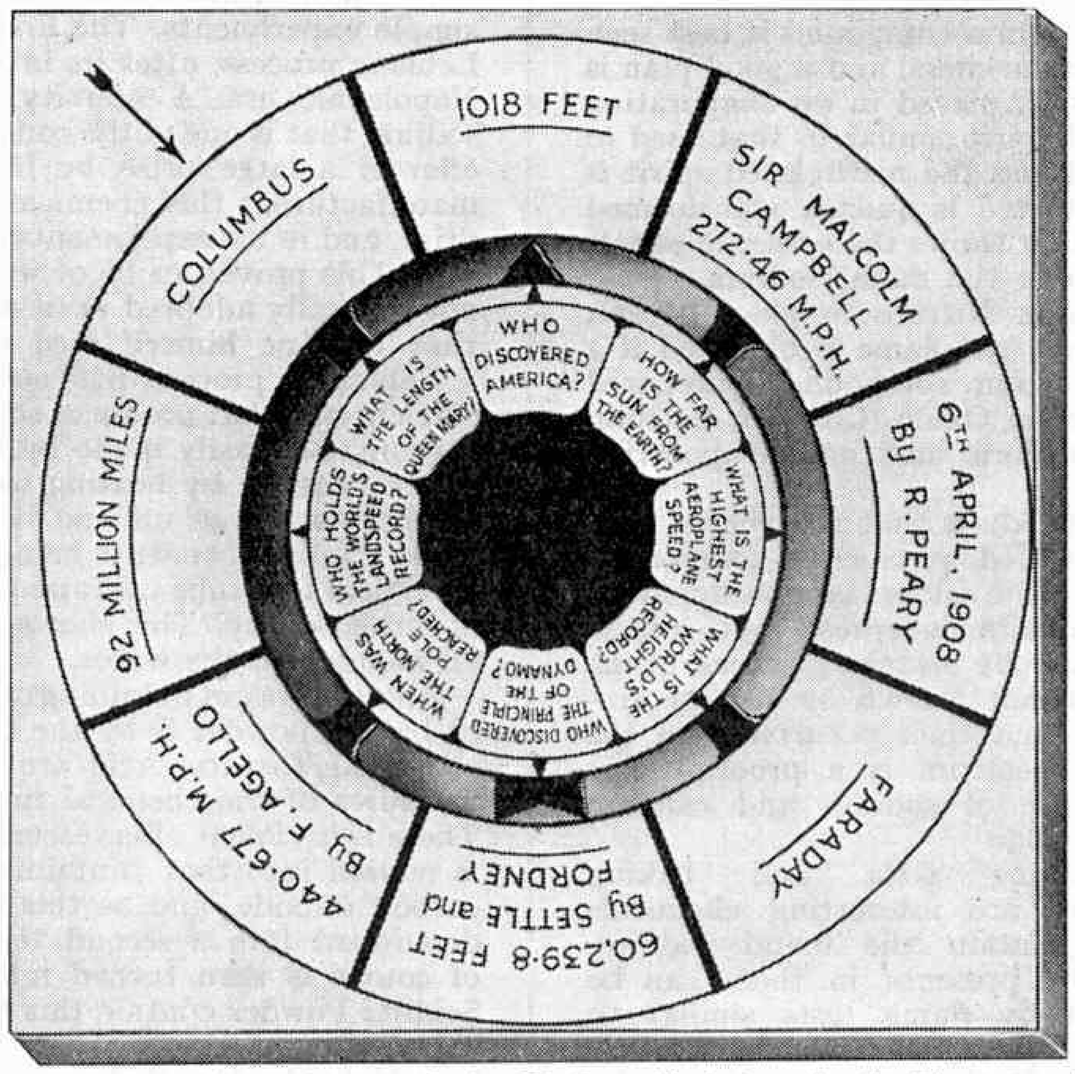
It is advisable to complete the drawing of the segments before cutting out the questioning disc, and when this has been made and placed on the lid of the box with its centre directly above the circles drawn on the lid, it will be found that it can be turned round until the boundaries of its segments are exactly in line with those of the sections drawn on the lid. A drawing pin pushed through the centre of the lid from below will provide a pivot on which the questioning circle can be rotated.

The segments can now be numbered in preparation for writing in appropriate questions and answers. It is best to begin with those on the lid. The one nearest the arrow in the corner is lightly marked with the figure 1 in pencil, and the remaining segments are numbered from 2 to 8 in order, proceeding round the circle in the direction opposite to that of the hands of a clock. The segment in the questioning disc to which the arrow points also is marked 1 and the remaining segments on it are numbered in order, as in the case of the lid, but this time proceeding in the clockwise direction.

The next step is to prepare the fixed magnets used in the device. Two steel needles $1\frac{3}{4}$ in. in length are required for these magnets, and two pieces of this length, broken from a large steel needle also can be used. In each case the pieces of steel are magnetised as strongly as possible by steadily drawing one pole of an Elektron Bar Magnet along each repeatedly. Either the north pole or the south pole of the Bar Magnet can be used, but of course the one employed must not be changed while magnetising any one piece of steel.

The next step is to find which is the south pole of each magnet. This of course should be known from the magnetising process, for if the north pole of the Bar Magnet is used for this purpose, the end of the needle at which it is withdrawn on completing the stroke will be of south polarity. In order to avoid possible confusion, however, each magnet should be carefully tested with the Compass Needle. The end of each newly-made magnet that attracts the north pole of the Compass Needle is its south pole.

The magnetised needles are then placed side by side, with their south poles together, and laid on the underside of the questioning disc with their south poles exactly under the middle of the segment already marked 1, and their north poles similarly placed with regard to the segment marked 5. The middle points of the two magnets then will be under the centre of the disc, and they are



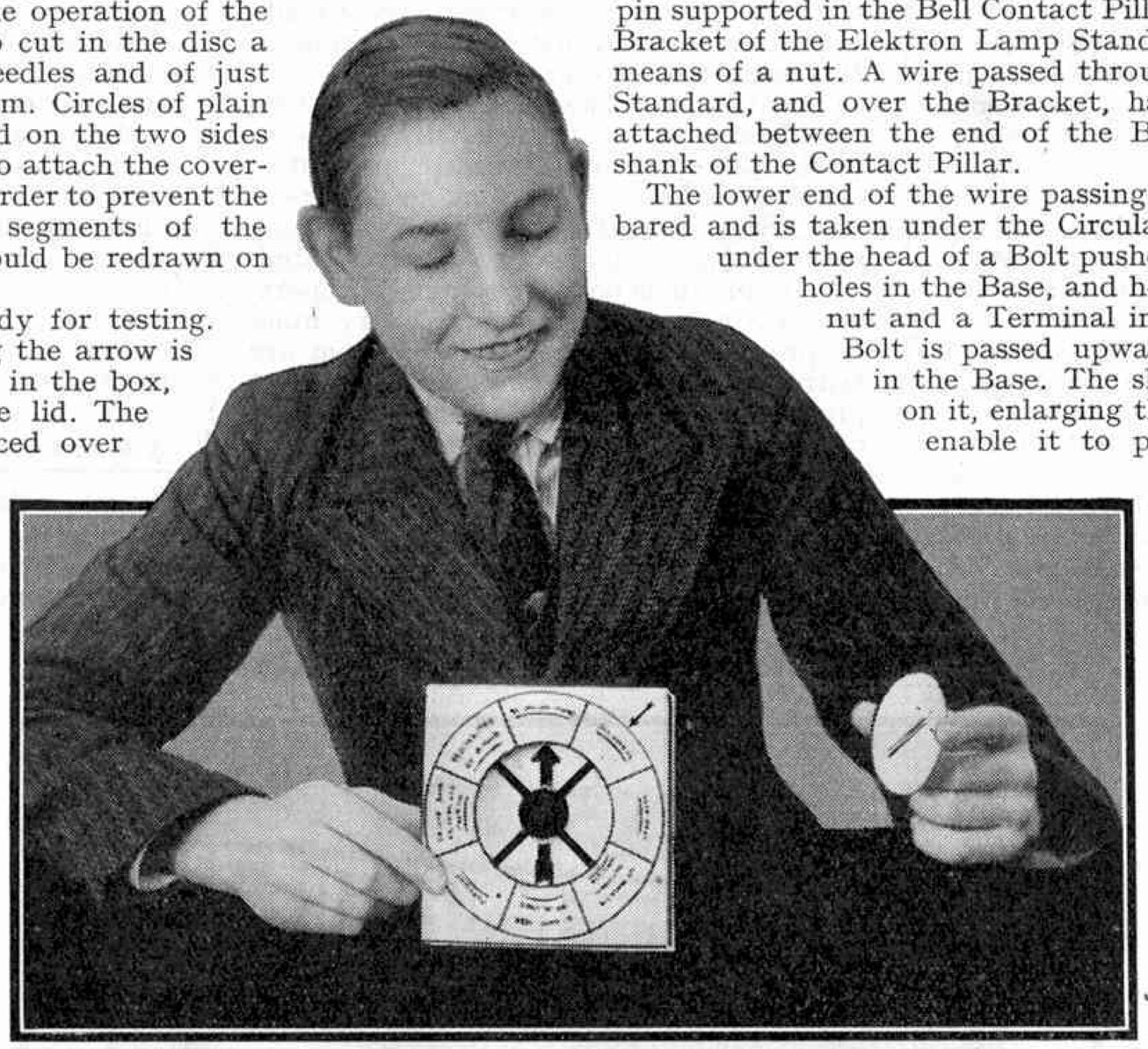
A magnetic question and answer device. The inner disc is turned so that the segment containing the question to be asked is opposite the arrow in the upper left-hand corner, and the black arrow below the disc then points to the answer.

fastened in this position by means of strips of gummed paper.

An alternative method of fastening the magnetised needles in position that has the advantage of concealing them, and thus of making the operation of the device more mysterious, is to cut in the disc a slot of the length of the needles and of just sufficient width to receive them. Circles of plain white paper are then gummed on the two sides of the disc, care being taken to attach the covering circles of paper tightly in order to prevent the needles from moving. The segments of the questioning disc of course should be redrawn on its new upper surface.

The apparatus is then ready for testing. The Compass Needle carrying the arrow is placed on the Compass Pivot in the box, which is then closed by the lid. The questioning disc is then placed over the drawing pin in the centre of the lid with the segment numbered 1 opposite that with the same number on the lid. The Compass Needle should then swing round until the arrowhead points to these segments.

The questioning disc is turned so as to bring other segments in turn opposite the arrow marked on the lid of the box, and in each case it is found that the Compass Needle swings round to point to the correspondingly numbered segment in the outer circle. The explanation of course is that the system of numbering adopted ensures that the south poles of the magnets on the disc are placed opposite this segment. They attract the north pole of the Compass Needle, while their north poles attract its south pole. The Compass Needle therefore comes to rest immediately under the fixed needles and the arrow carried on it points in the required direction.



The answering arrow of the device is controlled by magnets fixed under the questioning disc.

All that now remains is to draw up a suitable list of eight questions, each with its corresponding answer. These are numbered and the questions are written or printed on the correspondingly numbered segments of the questioning disc, and the answers are reproduced in the segments bearing the same numbers on the lid of the box. When the answer to any question on the disc is required, this is placed over its pivot and turned until the segment containing the question is opposite the arrow on the lid of the box. The arrow inside the box immediately swings round to point to the appropriate answer on the outer ring of segments.

The questions and answers can be left to the experimenter. They may be serious or humorous, and may even be deliberate "howlers" in order to provide amusement. There is no difficulty in suiting them to any special occasion, and the amount of fun that can be obtained from the device can be increased by making duplicates from sheets of stiff paper of the top of the questioning disc and of the parts of the lid of the box on which the answers are written, and writing on them questions and answers to suit various needs. The questions that may be asked can then be changed at a moment's notice without disturbing the mechanical and magnetic arrangements.



A vertical wire between the poles of an electro-magnet that swings to one side when current from the Elektron Bichromate Cell is passed through it.

The experiment shown in progress in the lower illustration on this page is of special interest and importance because it demonstrates the principle on which the electric motor works. In preparing the apparatus a small loop is twisted on the end of the 6-in. length of 26G Copper Wire included in the No. 1A and No. 2 Elektron Outfits, or a similar piece of thin copper wire, and it is hung from a pin supported in the Bell Contact Pillar fitted below the end of the Bracket of the Elektron Lamp Standard, and held in position by means of a nut. A wire passed through the Erinoid Tube of this Standard, and over the Bracket, has its upper end bared and attached between the end of the Bracket and the bolt on the shank of the Contact Pillar.

The lower end of the wire passing up the Erinoid Tube also is bared and is taken under the Circular Base. There it is fastened under the head of a Bolt pushed up through one of the two holes in the Base, and held in position by means of a nut and a Terminal in the usual manner. Another Bolt is passed upward through the second hole in the Base. The sheet of Copper Foil is placed on it, enlarging the hole in the end slightly to enable it to pass over the shank of the Bolt, and is firmly held in the position shown in the accompanying illustration by means of a Nut. A Terminal also is fitted on this Bolt.

The lower end of the Copper Wire suspended from the Bracket is twisted back on itself to form a small loop and to give an overall length of about 5 in. It then swings clear of the sheet of Copper Foil. A short piece of Connection Wire is stripped of its green covering. One end is bent to hook on the lower end of the suspended wire, and at the same time its length is adjusted so that the lower end forms a springy sliding contact with the sheet of Copper Foil. Wires are taken from the Terminals on the Circular Base to one terminal of the Elektron Bichromate Cell and one Terminal of the Switch respectively, and the remaining terminals of these are connected with each other by means of another length of wire. Finally the Horseshoe Magnet is placed on a supporting stand of convenient height with its poles projecting so that the Copper Wire suspended from the Bracket of the Elektron Stand passes between them.

The carton containing the supply of Potassium Bichromate included in the Outfit is suitable, but must be used upside down, so that no magnetic material is brought near the Horseshoe Magnet. Any other support that is used should not contain iron or steel.

When the apparatus has been fitted up, the Switch is closed. This completes an electric circuit through the vertical copper wire and the sliding contact to the sheet of Copper Foil, and immediately the vertical wire kicks to one side. When the Horseshoe Magnet is turned over so as to reverse the positions of its north and south poles and the circuit again is closed, the wire moves in the opposite direction. A similar reversal is brought about by interchanging the wires leading to the terminals of the Bichromate Cell, and when both changes are made at the same time the direction of movement of the wire remains unaltered. A more violent movement is obtained when the stronger current given by using two Bichromate Cells in series is passed through the vertical wire.

It is easy to see that the direction of movement depends upon the direction of the current, and also upon the direction of the field of magnetic force in which the wire carrying it is placed. Turning the magnet into various positions also causes the wire to move in different directions and it is interesting to work out the connection between its movement on the one hand, and the direction of the current passing through the wire and that of the lines of magnetic force on the other.

Power from Peat Bogs—*(Cont. from page 9)*

tenders of the locomotives using it, and is blown into the firebox as required by means of compressed air. A small coal fire is kept alive in the firebox and the powder burns almost instantaneously with little waste and only a very small amount of smoke. The powder also is used for steam raising in other types of boiler and in one method quicker combustion is attained by blowing it into the fire by means of hot air. As a source of heat 1.2 lb. to 1.4 lb. of dried peat is the equivalent of 1 lb. of coal.

A third method of turning peat to good advantage depends on its conversion into charcoal. Peat is not very dense and ordinary processes applied to it give a charcoal that is bulky and does not stick together. The high percentage of ash usually found in peat also presents a difficulty, for often this constituent is readily fusible and its presence spoils the charcoal. Some peats give a product that is hard and dense and has high heating value, however, and in other cases the difficulties are overcome by pressing the peat into blocks that are piled in heaps and burned in much the same way as wood is treated by the charcoal burner.

There are also several processes in which peat is turned into charcoal by heating it in retorts in the same manner as coal is heated in gas works to make coke. Like coal, peat produces a gas when heated in this manner and this gas can be used as a source of heat in power production. One of the best known methods of this kind is called the Ziegler process and is used on a fairly large scale in Russia and other European countries. Air dried peat is the raw material. The proportion of moisture in this is reduced to about 25 per cent. with the aid of heat derived from the combustion of peat gas from a previous operation, and the residue is then partially or completely coked in specially constructed retorts. In this method considerable importance is attached to the recovery of by-products and a plant at work in Germany dealing with 35,000 tons of air-dried peat a year produced 1,380 tons of light and heavy oils during that period. Other products included 270 tons of calcium acetate, 184 tons of ammonium sulphate, 92 tons of methyl alcohol and 230 tons of solid paraffin.

Peat, coke or charcoal obtained by the Ziegler process has been used as a bunker fuel, especially in the German Navy. It is never likely to prove really useful for this purpose because it is not sufficiently dense, but has been extensively applied in treating armour plate to make it harder.

It is probable that the most important application of peat eventually will be found in the production of peat gas combined with the recovery of the valuable by-products already referred to. Peat is now finding increasing use in the manufacture of producer gas, which can be described as gas produced by the partial combustion of solid fuel. It is an excellent source of heat and power and the application of peat to its production may lead to extensive developments in many districts where this fuel is available in large quantities, and the progress of industry has so far been retarded by the high cost of the transport of coal. Progressive schemes have already been put forward for the generation in this manner of power from peat.

The plants in which peat gas is produced have to be of special design owing to the large proportion of water present in the raw material. They tend to be expensive, therefore, but steady progress is being made and financial success seems assured. The by-products have an extremely important bearing on this. Their recovery must be provided for, since many of them are fairly valuable. The two that are most profitable are calcium acetate and ammonium sulphate, and a ton of dry peat gives about 8 lb. of the former and nearly 160 lb. of the latter. The ammonium sulphate is derived from the nitrogen in the peat and the proportion of this retained in the by-products depends largely on working conditions. Up to 80 per cent. or even more is now obtainable, however, and the profit on the sale of ammonium sulphate and the calcium acetate produced usually is sufficient to cover all working costs. There are therefore enormous possibilities in the experiments that are still being undertaken with peat and in time this fuel almost certainly will be used on a large scale for the production of power, and especially in the generation of electricity.

An Interesting Cardboard Model



This illustration shows a small scale model of a London Transport omnibus, made principally from cardboard. It has upholstered seats on both upper and lower decks, and is painted in red and white. It is interesting to note that the model is fitted with rubber tyred wheels of the kind used for the Meccano Dinky Toy Motor Cars. The model is 4¾ in. in length, 1¼ in. in width and 2½ in. in height, and was constructed by Lawrence Martin, Cuffley, Herts.

Dredging Fuel—*(Continued from page 3)*

beneath him. With their communicating gangway, they have been compared to the bridge of a giant liner, and the great size of the dredger-excavator and the immense power of its motors justify the comparison.

There are 11 motors in the superstructure, the largest being one of 820 h.p. that drives the endless chain carrying the excavating buckets. Four others, one of 10 h.p. and three of 60 h.p., drive the winches controlling the wire ropes from which the sections of the boom are suspended and those to which the balance weight is connected. A 34 h.p. motor is employed for rotating the superstructure; and other motors operate the chutes into which material is delivered by the excavating buckets, and drive compressors that give the compressed air required for applying the brakes fitted to the machinery and for moving the doors of the chutes through which wagons are filled with excavated material. With the motors driving the carriage, there are altogether 15 motors in the machine, with a total of 1,220 h.p.

A more recent machine built by the same firm is claimed to be the greatest dredger-excavator in the world. It has two chains of dredger-buckets, one for deep excavating and the other for work at higher levels, and the two can work independently. This machine has a capacity of more than 2,000 cu. yds. an hour, and its 18 electric motors have a total of about 1,000 h.p.

A Maori War Canoe—*(Continued from page 33)*

artistic value. In the design most usually adopted for bow pieces a small figure with arms outstretched backward and with protruding tongue was seen bending forward as though to dive into the water. In addition there were two large scroll designs. In another prominent type of bow piece the grotesque figure was absent, and the large scrolls were replaced by a number of smaller scrolls. The stern pieces, which varied little in form, consisted of a vertical fin of carved totra wood with a bell-like centre rising perpendicular from a curve at the base, and terminating in a gentle curve in the top front of the piece. The remainder of the structure was built up of exquisite carvings of little figures of human beings and animals.

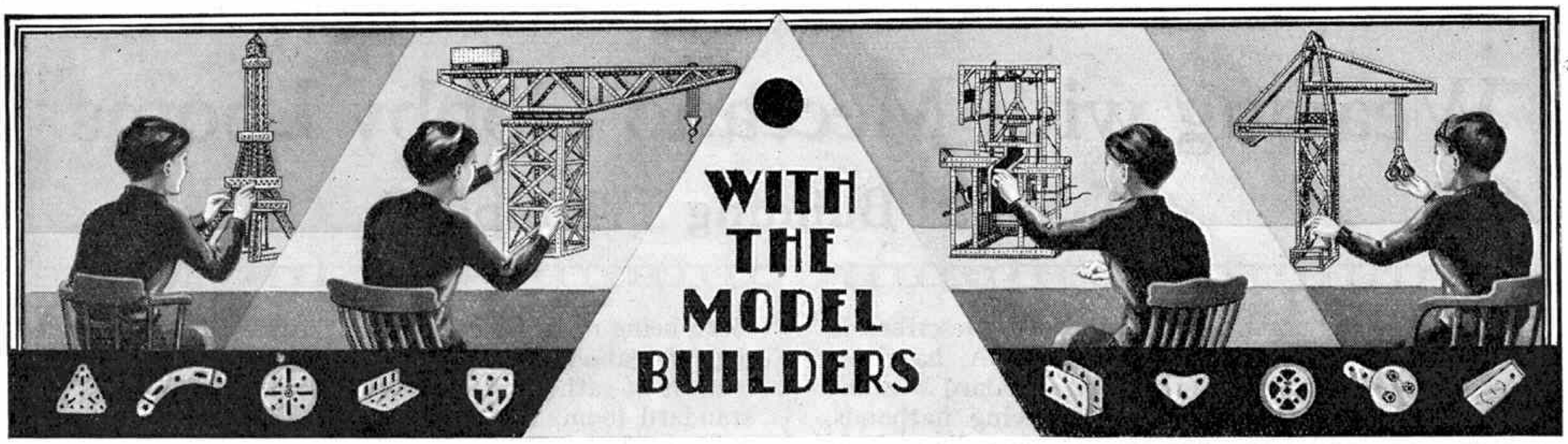
While the bow and stern pieces of the canoe were receiving attention the construction of the flooring was commenced. This consisted of a grating about 18 in. above the bottom of the canoe, made of small straight rods of manuaka wood about 1 in. in diameter laid longitudinally and supported by cross-pieces. In large vessels of the war canoe class one or two openings were left in the floor, so that any water that collected below the flooring could be baled out. When the flooring had been completed and the bow and stern pieces added, the canoe was ready to be launched and to commence its career.

On a "Night Goods"—*(Continued from page 17)*

yesterday very much alive; baskets of poultry, kegs of butter, cases of eggs, and hampers of fruit and vegetables.

Special measures are employed to ensure the swift conveyance of these miscellaneous foodstuffs to Smithfield, Covent Garden and elsewhere. Suitable containers are used in increasing numbers for perishable traffic of this nature, and fast motor vehicles await the arrival of trains at Nine Elms.

If we could follow the West Country farm produce in the final stages of this cycle of efficient transport we should find ourselves at one or other of the great London markets. Of these none is more interesting than Smithfield, the famous meat market. In addition to specially rapid transport arrangements from centres of production that are afforded by all the four group railways by way of their London goods depots, there is actually a railway station situated underground below the market.



COIL WINDING MACHINE

For Meccano electrical devices such as induction coils, electro magnets, motors, etc., the process of winding the coils by hand is very tedious and it is almost an impossibility to obtain satisfactory results. The best method of producing coils is by means of a coil winding machine, driven from an Electric Motor if one is available, but if necessary the machine can be driven by hand.

The essential part of the device is a shaft for carrying the core of the coil. The shape of the core will govern the type of fitting employed for holding it in position, and Bush Wheels or Face Plates, fitted with Angle Brackets, will be found suitable for holding most shapes of built-up Meccano cores. The shaft carrying the core is connected through suitable gearing to the handwheel or Motor, and until experience is obtained, it is advisable to wind the wire on fairly slowly. A gear-box between the Motor and the coil would be an advantage, and it is advisable to employ a Resistance Controller in the circuit for regulating the speed.

It is generally necessary to know the number of turns that are wound on to the core, and it is especially so in the case of induction coils. For this purpose a revolution counter should be built up by arranging reduction gearing to be driven from the coil winding shaft, and to operate indicating dials. These may be made to show tens, hundreds and thousands according to the work being carried out.

A Screwed Rod arranged in front of the winding shaft is useful for distributing the wire evenly on the coil. The Rod may be provided with a Threaded Boss or a similar part that is connected to a sliding carrier fitted with a $\frac{1}{2}$" loose Pulley Wheel. If the wire is passed round the groove of the Pulley it can be distributed evenly by operating a handwheel on the end of the Screwed Rod. The handwheel may be fitted on a layshaft provided with different gears at each end. By pressing the Rod inward against the action of a Compression Spring one set of Gears would be engaged, and when the Rod was released, a different gear ratio would be brought into use by the Compression Spring. Thus two turning speeds would be available for speeding up or slowing down the movement of the Rod as required.

CLUTCH WITHDRAWAL MECHANISM

The withdrawal mechanism of a friction clutch has to operate against the pressure of the spring that normally keeps the members of the clutch in engagement. Consequently the mechanism should be designed to produce as little friction as possible when operating against the pressure of the spring. It is also necessary to ensure that the friction clutch is not misaligned by the withdrawal mechanism.

A neat arrangement that gives very satisfactory results can be made from two Pawls carried on a Rod placed transversely above or below the Rod carrying the clutch. The Pawls should be so placed that the part that normally engages a Ratchet bears against the face of a Bush Wheel, forming one member of the clutch. One Pawl is placed on each side of the Wheel boss in such a manner that it bears on the surface outside the holes. The Pawls should be secured rigidly on the Rod, which may be connected to an operating lever or foot pedal by Cranks and levers.

VENTILATING FAN

A novel use for the Meccano Fan, No. 157, is to add realism to a model engine house or factory, etc. Readers will be familiar with the circular holes made in the walls of such buildings and fitted with a fan for extracting the exhausted atmosphere inside. In a Meccano model the circle can be formed from $2\frac{1}{2}$" small radius Curved Strips. The Meccano Fan fits inside this circle, and bearings for its Rod are formed by two $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips placed at right angles in the form of a cross and secured to the Strips by Angle Brackets. A Double Bent Strip attached to one of the Double Angle Strips forms a second bearing for the Fan Rod. To complete the effect, the Fan should be operated from shafting or from a Motor by means of a belt and Pulleys. A Fan is used for this purpose in the model workshop illustrated on this page.

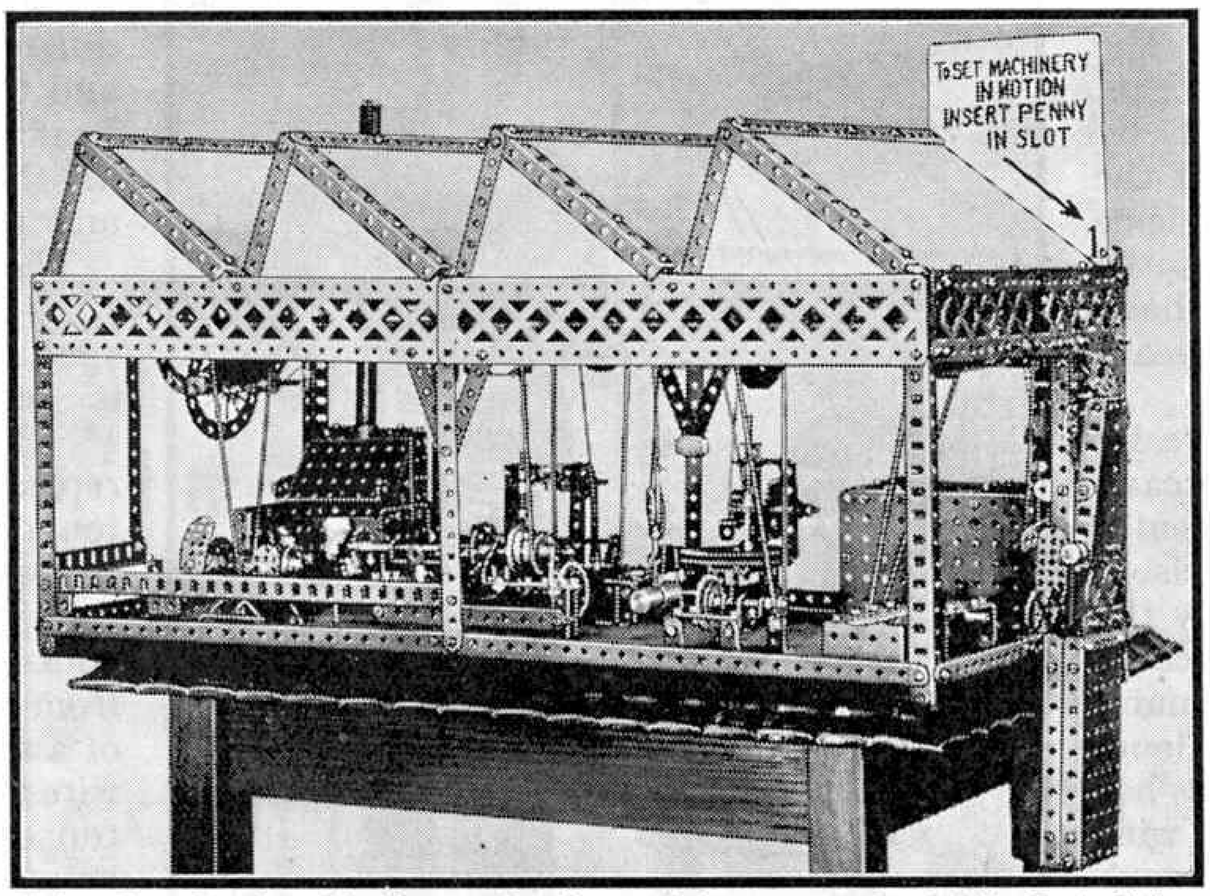
LARGE FLYWHEELS

A large wheel suitable for use as a flywheel or a pulley can be made from two Ring Frames, No. 167B. For use as a flywheel the parts should be bolted together directly, but if intended for a pulley wheel they should be spaced apart by two circles of 4" Curved Strips placed face to face and secured on the $\frac{3}{8}$" Bolts that join the two Ring Frames together. Two Bush Wheels fixed on an Axle Rod are used for the hub, and each is provided with eight End Bearings in which 4" Rods are secured. The Rods pass through the holes around the rim of the Ring Frames, and a Collar on each Rod bears against the inside of the rim. There are 16 holes in the rim of each Ring Frame, and the spokes are arranged in every other hole. The spokes on one side of the wheel should be opposite the spaces between the spokes on the other side of the wheel.

For an extra large wheel, $5\frac{1}{2}$" Curved Strips can be used for the rim. Twelve of these Strips are necessary for each side of the rim, and are bolted together by their end holes. The two circles of Strips are spaced apart by Washers on $\frac{3}{8}$" Bolts.

In this case two 4" Circular Plates are used for the hub, and 8" Axle Rods for the spokes. The Rods are held in Collars secured to the outermost holes of the Circular Plates by means of bolts, screwed into their tapped bores and each provided with a Washer beneath the head and another placed between the Plate and the Collar. A Grub Screw in the other bore of the Collar grips the Rod in place. The Circular Plates are provided with Bush Wheels by which they are secured to the Rod, and are so arranged that the spokes of one are midway between the spokes of the other. The outer ends of the Rods are attached to the rim by means of small Fork Pieces.

Wheels such as these can be applied to various uses, and are especially suitable for engine flywheels or for the pulleys of large pit-head gears. For use as flywheels their effectiveness would be improved if the rim were made solid of a number of $5\frac{1}{2}$" Curved Strips, instead of only the two sets spaced by Washers. To true up the wheels they should be mounted so that, when spun round, the irregularities can be noted and corrected by adjusting the spokes in the Collars.



This well equipped model of an engineering workshop was constructed by J. A. Piejus, Winchmore Hill, N.21. The insertion of a penny in a slot sets the various machines in motion.

ACCUMULATORS FOR CURRENT SUPPLY

Those who are not so fortunate as to have alternating mains current available for the use of a Transformer must employ an accumulator for driving Meccano Electric Motors and other electrical apparatus. In such cases the 20-volt power units are unsuitable, and the 6-volt Motors should be used. The accumulator should have a capacity of not less than 20 ampere-hours, and although one of larger capacity will last longer on one charge, sizes larger than 6 volt 20 amp.-hr. are rather cumbersome for ordinary use with Meccano models. The Meccano Accumulator is supplied specially for this purpose.

If long life is to be expected from an accumulator, it should be given careful treatment. On no account should it be left for long periods in a discharged condition. It should be charged at regular intervals, and when in use should be treated with care to avoid overload. Short circuits cause serious damage to an accumulator, and to avoid this, a short length of 41 S.W.G. tinned copper fuse wire should be connected in the circuit. Thus in the event of serious overload, the fuse wire melts before any damage is done.

To control the speed of an Electric Motor driven from an accumulator, a 6-volt Resistance Controller should be connected in series. The controller serves also as a switch.

LARGER SLEEVE PIECES.—The present size Sleeve Piece (No. 162) has a very wide range of uses in the Meccano system and is particularly useful for representing cylinders on small steam engines, chimneys, etc. The ends of the part fit exactly inside $\frac{3}{4}$" Flanged Wheels.

A larger sleeve piece for use with $1\frac{1}{8}$" Flanged Wheels would probably be useful for a number of purposes, although it is doubtful if it would be so adaptable as the existing parts. The Ship's Funnel (No. 138) can be used in many cases where a larger sleeve piece is found necessary. This part is 1" in diameter and fits exactly round a 1" Pulley Wheel. At one end it is provided with perforated lugs, by means of which it can be bolted down to the model.

It would appear that the general utility of the Ship's Funnel is not realised by many model-builders. An extra long cylinder can be made by securing two 1" Pulleys on a short Axle Rod and placing each Pulley into the open end of a Ship's Funnel, the two being butted closely together. The length of the part so formed is 4", and the securing lugs at each end enable it to be fitted in position. Such a unit can be used also as a supporting column in certain structures. (*Reply to K. Chirgwin, Wootton Bassett, Wilts.*)

SCREWDRIVER AND SPANNER IMPROVEMENTS.—Your proposed screwdriver may be of use in certain cases, but its applications would be very limited. The part would consist of the usual Screwdriver handle and shaft, at the end of which would be fitted a cup-shaped piece to fit over the bolt head. The advantage of the present Screwdrivers, No. 36a and 36b, is that they can be pushed through Meccano holes, and thus be applied to bolts that are in awkward positions.

To make the Spanner with a round handle of the same diameter as Meccano Rods would enable the handle to be extended by Axle Rods and Couplings, so that the tool could be used for holding nuts that are awkwardly placed. The existing Spanners, however, can be adapted for this purpose by bolting them to Strips. Two Strips should be used, one being placed on each side of the Spanner, which is securely gripped in position when the nuts and bolts holding the Strips are tightened up.

The jaws at each end of the present type Spanner are cut at different angles to the shaft, so that alternate ends can be used for tightening nuts that are in awkward corners. This useful arrangement would be lost in your proposed new part. (*Reply to B. Nelson, Weston-super-Mare.*)

Weaving with Meccano Dobby Looms

A Model-Building Triumph

FOR many years past the Meccano Loom, described in Super Model Instruction Leaflet No. 16A, has been one of the most popular of all the larger standard Meccano models. This model is capable of weaving hatbands, neckties, etc., and large numbers of boys have built it and operated it with success.

Owing to the comparatively simple nature of its construction, however, this model is only capable of weaving cloth of a rather coarse nature, its texture being that of a knitted article rather than that of a piece of cloth or a handkerchief. Many successful attempts have been ma e by Meccano enthusiasts to improve the original loom from a mechanical point of view, but little attention has been given to the production of cloth of improved texture similar to that woven on actual looms. The mechanical side of the model can, of course, be understood by almost any Meccano boy, but the actual weaving involves problems that can only be dealt with satisfactorily by those who have actually taken part in real weaving.

The problem of weaving really good material with a Meccano Loom has been tackled recently by Mr. J. Yoxall, of Nelson, Lancashire, who has not only the necessary knowledge of Meccano, but also has worked for many years in a cotton mill as a loom overlooker. This occupation has brought him into contact with almost every process through which cotton passes before it emerges as finished cloth, and it is this knowledge that Mr. Yoxall has applied to the problem of building a Meccano Loom to weave real cloth. His first improved loom was similar to that of the standard Meccano model, but was an improved design capable of producing material of a similar texture to good quality handkerchieves. His latest efforts take the form of more elaborate and complicated dobby looms by means of which intricate patterns, including words and even sentences, can be incorporated in the weaving of the cloth. These looms are a very fine achievement, and represent Meccano model building at its highest pitch of perfection. In this article we shall describe briefly some of Mr. Yoxall's looms.

The first loom to be built with Meccano parts had many defects, and it was soon followed by the improved model that at present forms the subject of Special Instruction Leaflet No. 16A. The modified form of this loom is shown in Fig. 3. This is capable of weaving cloth similar to that produced by the standard loom, the cloth being made up of 60 warp threads, and the finished material about 3 in. wide. The cloth produced by this loom is of rather better quality than that woven by the standard loom, but the model contains little improvement in design.

The loom shown on the right in Fig. 2 represents a great improvement. Originally it wove cloth made up of 208 warp threads. These threads were of much smaller material than those used in the standard model, and as the finished cloth was of exactly the same width, it was very much finer and quite up to the standard of many ties and scarves sold commercially. The model has since been altered to enable it to weave cloth $4\frac{1}{2}$ in. wide with a corresponding increase in the number of warp threads. The only outstanding differences between this model and that described in Instruction Leaflet No. 16A are to be found in the cam machinery, healds and reed.

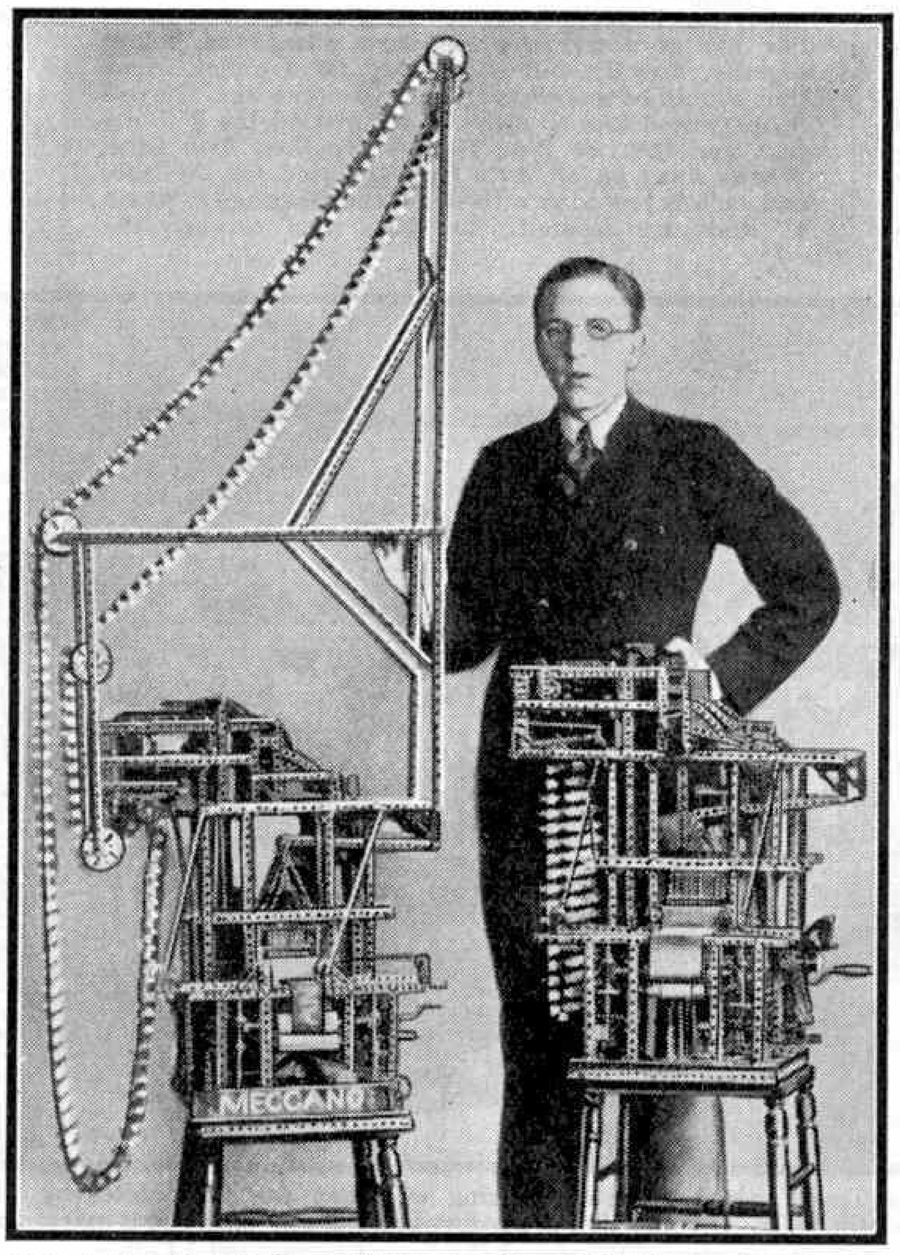


Fig. 1. Mr Yoxall, Jr., with the two fine dobby looms described in this article.

The cams are built up from two $1\frac{1}{2}$" Pulleys between which a specially shaped piece of steel is secured by means of two $\frac{1}{2}$" Bolts. This piece of metal replaces the Double Brackets found in the standard loom, and results in a much smoother action being transmitted to the picking sticks. The reed is a piece taken from an actual loom, and consists of a number of very fine flat steel wires. These are bound together top and bottom, and are carried between two pairs of Strips bolted to the sley.

The healds also are identical with those used in a real loom. They are stamped out from very thin sheet metal, and are much longer than Meccano Healds, Part No. 101. The loops at each end are of a similar size to standard holes, however, and these healds therefore can be mounted on Rods in a similar manner to the Meccano Healds.

A few useful refinements that may be of interest to those who have built or who intend to build the Loom are incorporated in all three looms shown in Fig. 2. The sides of the sley, which keep the shuttle in its correct position, are fitted with pieces of ribbon as shown. These pieces of ribbon form a smooth surface against which the sides of the shuttle rub, and in this way the shuttle movement is made more reliable, and at the same time the shuttle is kept clean and bright. The ribbons need to be replaced from time to time, as they collect dust very rapidly.

A refinement is also added to the shuttle when very fine weft is being used. This consists of a small piece of fur about 1 in. in length, pasted on one of the inside

faces of the part. This fur presses lightly against the weft wound on the spool, and in addition the weft is passed through the fur before it enters the small hole in the side of the shuttle. In this manner a light retarding effect is applied to the weft as it is fed into the warp, and by this means the spool is prevented from unwinding too freely.

It should be noted that this fur brake can only be applied to the old style Shuttle. If it is wished to fit it to a new style Shuttle, the spring brake must first be removed, as this is far too fierce for delicate work.

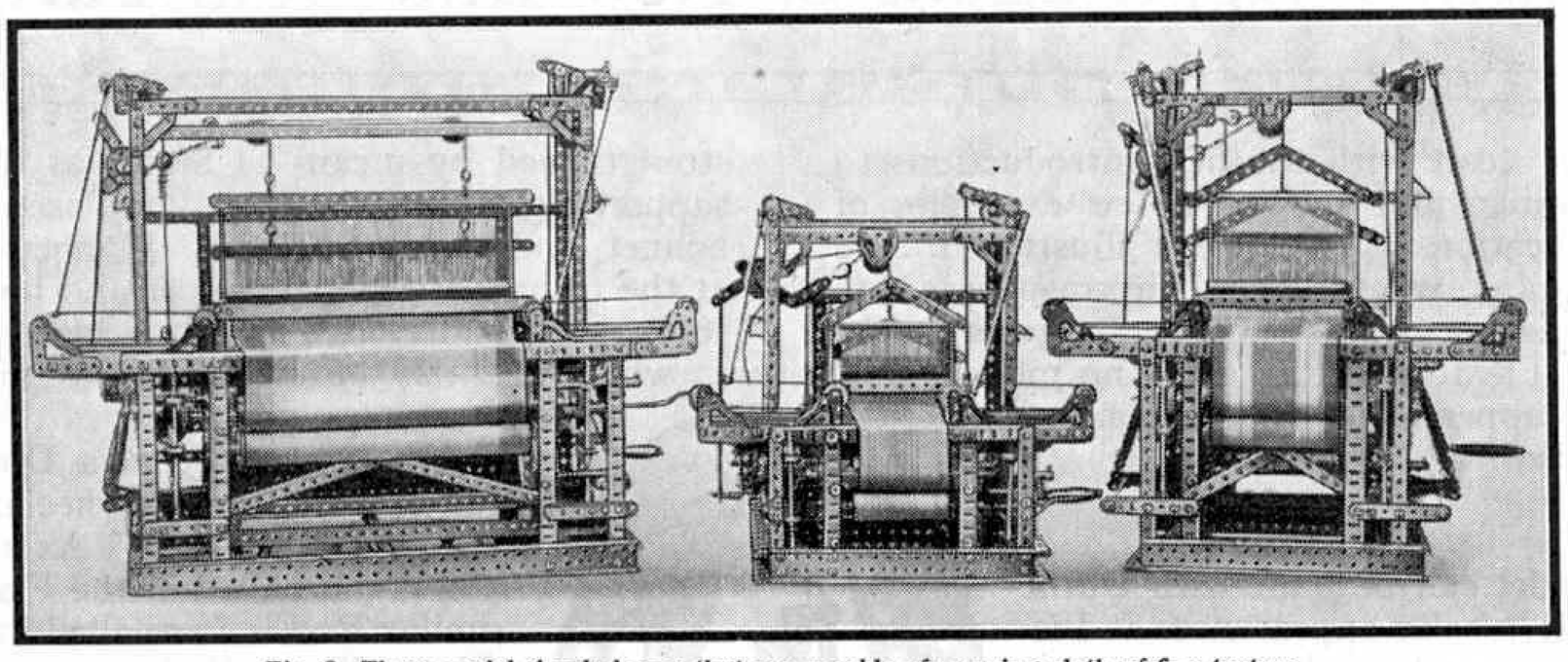


Fig. 2. Three model simple looms that are capable of weaving cloth of fine texture.

As already mentioned, the right-hand loom in Fig. 2 has recently been altered so that an increase of $1\frac{1}{2}$ in. in the width of the finished cloth has been obtained. This increase, in addition to necessitating extra warp threads, also made the enlarging of the heald frames and reed necessary. The widening of the heald frames was a comparatively simple matter, but in order to accommodate the reed it was necessary to reconstruct the sley slightly. This alteration would of course be necessary in the standard Meccano Loom if this change were to be carried out.

In the centre of Fig. 2 a much smaller loom is shown. This has been specially made to be carried about, and is therefore compact and as light as possible. Its construction and operation are almost identical with that of the model just described. This model has recently been fitted with a motor, with which it works with surprising ease and reliability. This is the first occasion, to our knowledge, on which a Meccano loom has been successfully power driven, and it seems to open up a new field of Meccano model-building.

The left-hand model in Fig. 2 is larger than the other two and will actually manufacture handkerchieves, the texture of the material produced being in every way up to good quality commercial standard.

Although the framework of this model is in many ways different from that of the model described in Instruction Leaflet No. 16A, the mechanism is almost identical. The only extra power required is for giving the Shuttle greater impetus, and this is obtained by simply increasing the tension on the Springs.

We come now to a far more complicated and difficult type of Meccano Loom. This is the dobby loom, two examples of which are shown in Fig. 1, together with Mr. Yoxall, jnr. These models are undoubtedly the highest point yet reached in Meccano Loom construction, from both a mechanical and weaving aspect. The designs that these models can produce are practically of unlimited variety. The larger loom, seen on the left, is capable of weaving the word "Meccano," a sample of the work being shown at the base of the loom. The smaller model weaves cloth of beautiful texture and design, that compares favourably with any similar material.

For this type of work the operating mechanism is naturally fairly complicated, and is perhaps beyond the ability of the average Meccano enthusiast. A brief description may be of interest, however. Each heald frame is attached to a long lever as shown, and this in turn is connected by a system of levers to two specially made hooks. These hooks are about 5 in. in length, and are pivoted at their ends to the system of levers just mentioned. The hooks proper can be lowered at will, so that they engage with two horizontally sliding Rods that move once for every cycle of operation of the loom. Thus any of the heald frames, seven in number, can be lifted as required by a mechanism giving a predetermined selecting movement.

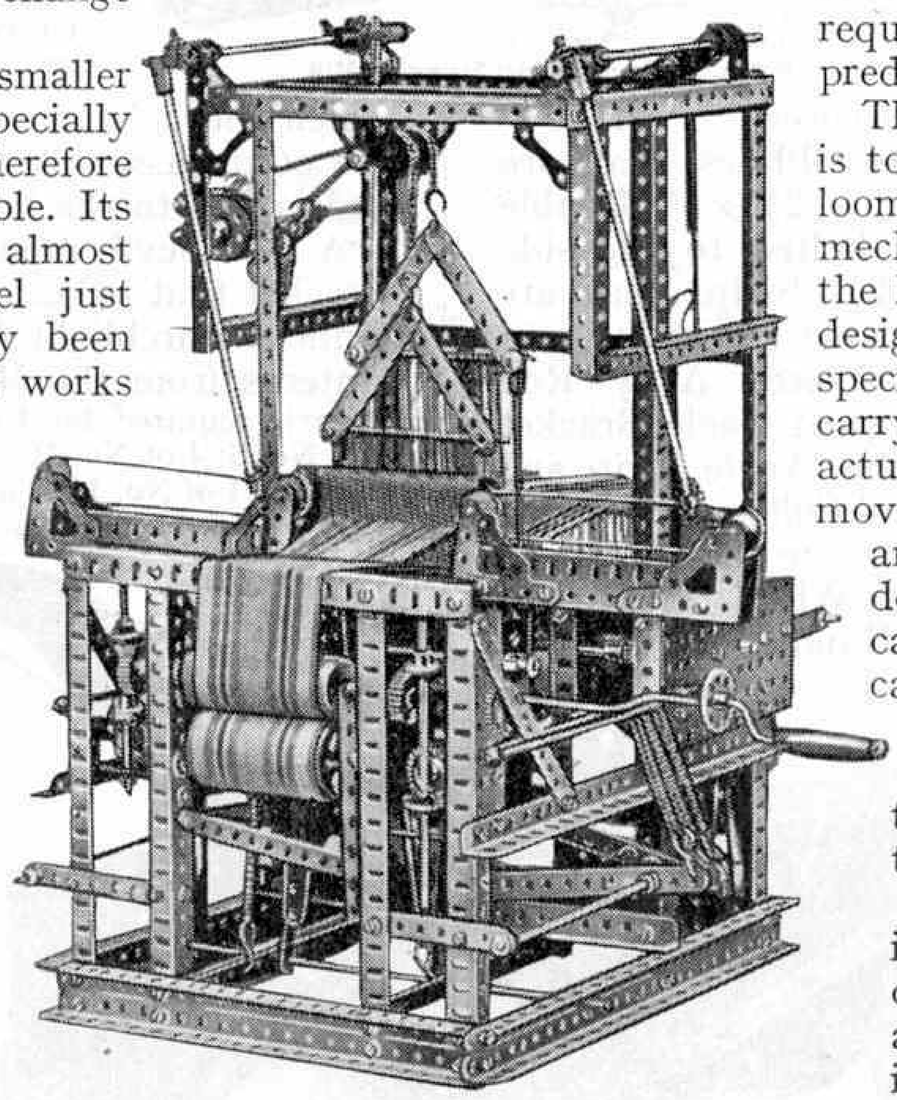


Fig. 3. A modified reproduction of the standard Meccano loom built by Mr. Yoxall.

This mechanism is the dobby, and is to be seen fitted on the top of each loom. The dobby is exactly the same mechanically in both models, but in the larger one, in order to weave longer designs such as the word "Meccano," special framework has been fitted to carry long lengths of lags, just as in actual practice. In fact, the whole movement of the Meccano dobby is an accurate reproduction of a real dobby. These lags are bars of wood carrying pegs, the positions of which can be altered at will. The lifting of the healds is controlled by the pegs coming in contact with the mechanism of the dobby as the lags rotate.

The mechanism rotating the lags is operated, once for every movement of the picking sticks, by means of a crank incorporated in the mechanism of the model. A long coupling rod connects this crank with a vertically moving hook, made specially for the purpose. At every upward stroke this hook engages with one of four Rods forming the drum over which the lags pass.

All these models have been built by Mr. J. Yoxall, Nelson, Lancashire, who has made this work his special hobby. He is an invaluable adviser to anyone who is interested in looms, and he will be only too pleased to build models of looms for those who wish to enlist his services.

New Meccano Models

Further Applications of New Blue-Gold Parts

LAST month we dealt with the new introductions to the Meccano range and showed a few examples of their many applications. The models illustrated here show more instances where great improvements are effected by the use of the new parts. In general, the Strip Plates and Flexible Plates give the models a much more solid appearance, and in consequence add to their realism.

Stamping Mill

This simple model can be built with Outfit A, yet it has quite a solid appearance, and is interesting to construct and operate. An added feature is the use of the lanterns from the Meccano Lighting Set to illuminate the operating mechanism. One of the lanterns can be seen at the back of the model, and the other is mounted under the roof.

A $5\frac{1}{2}$" Strip is bolted to each corner of the $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate forming the base, and these are connected together at their upper ends by $2\frac{1}{2}$" Curved Strips as shown. Two $2\frac{1}{2}$" Strips are bolted between Angle Brackets secured to the $5\frac{1}{2}$" Strips, and carry $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates that are attached to the Curved Strips by a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip. Two Flat Trunnions, bolted to the side Flanges of the base plate, carry $2\frac{1}{2}$" Strips that are joined at the top by a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip to which a Reversed Angle Bracket is bolted. A $3\frac{1}{2}$" Rod slides in the upper hole of the Reversed Angle Bracket and in the centre hole of the Double Angle Strip and carries two 1" Pulleys. The lower Pulley forms the stamp and the upper one is struck on the underside by Flat Brackets bolted to a Bush Wheel. The Bush Wheel is carried on a Crank Handle journalled in two vertical $2\frac{1}{2}$" Strips, and retained in place by Spring Clips. As the Bush Wheel rotates, the brackets raise the stamp, which drops again as soon as it is released.

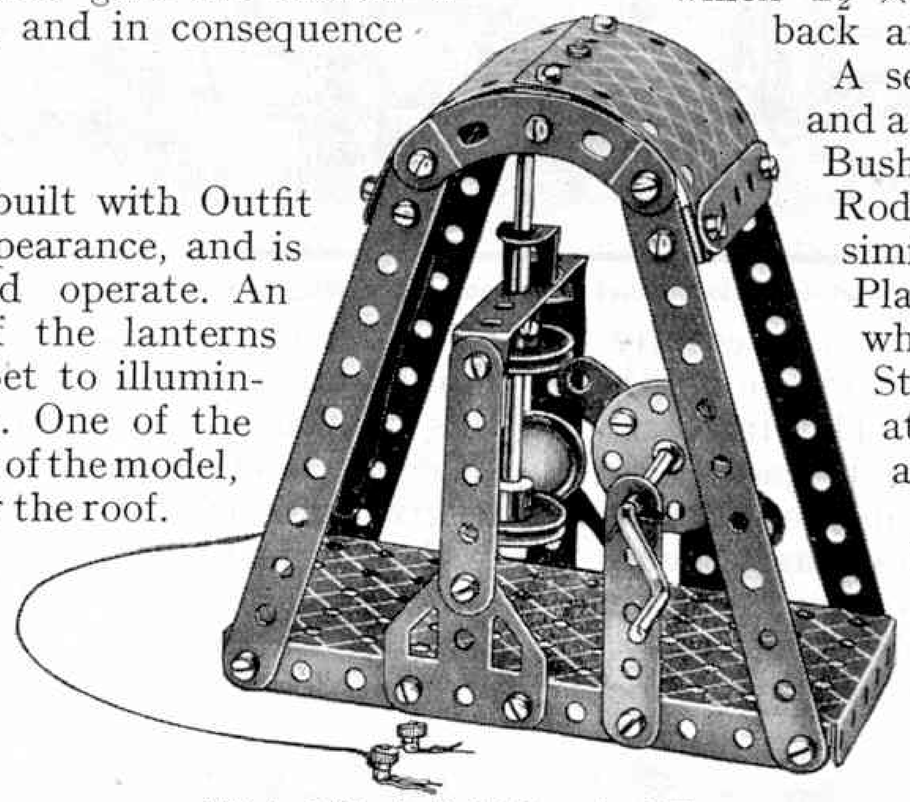


Fig. 1. A Simple Model Stamping Mill.

Parts required for Stamping Mill: 4 of No. 2; 6 of No. 5; 2 of No. 10; 4 of No. 12; 1 of No. 16; 1 of No. 19s; 2 of No. 22; 1 of No. 24; 2 of No. 35; 33 of No. 37; 2 of No. 48a; 1 of No. 52; 2 of No. 90a; 1 of No. 125; 2 of No. 126a; 1 Lighting Set.

Motor Breakdown Crane

The chassis of the model shown in Fig. 2 is made by extending a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate by means of a Sector Plate, the two being joined together by $5\frac{1}{2}$" Strips bolted along the edges. The sides are each formed from two Flexible Plates, $5\frac{1}{2}" \times 2\frac{1}{2}"$ and $4\frac{1}{2}" \times 2\frac{1}{2}"$, strengthened by means of Strips as shown. The Strips support also a further Sector Plate used for the top of the bonnet, and the new $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flanged Plate is mounted at the front, between the upper and lower Sector Plates, to form the radiator. The cab is built up from Strips to which $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates are bolted at the back and top.

A seat is made from a Double Angle Strip, and a dummy steering wheel is represented by a Bush Wheel on a $3\frac{1}{2}$" Axle Rod. A 4" Axle Rod is journalled in the Flanged Plate and a similar Rod is journalled in the lower Sector Plate. These Rods carry Road Wheels for which mudguards are provided by $5\frac{1}{2}$" Strips at the front and by $2\frac{1}{2}$" Strips fitted at each end with Obtuse Angle Brackets, at the rear.

Two $5\frac{1}{2}$" Strips are bolted to the upper holes of Trunnions that are secured to the $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate, and at their upper ends are extended by $2\frac{1}{2}$" Curved Strips. Cords are tied to the top of the jib so formed and to the back of the cab to retain the jib in position. A Crank Handle carries two $\frac{1}{2}$" Pulleys between which the hoisting cord is wound, and the other end of the cord passes over a $\frac{1}{2}$" loose Pulley at the jib head and is tied to the hook.

A 1" Pulley is mounted on a $\frac{3}{8}$" Bolt carried in an Angle Bracket that is bolted to the cab top. The Pulley represents a searchlight but can be replaced by one of the lanterns from the Meccano Lighting Set.

Parts required for Breakdown Crane: 8 of No. 2; 1 of No. 3; 9 of No. 5; 4 of No. 10; 1 of No. 11; 7 of No. 12; 4 of No. 12c; 2 of No. 15b; 1 of No. 16; 2 of No. 17; 1 of No. 19s; 4 of No. 22; 1 of No. 23; 1 of No. 24; 4 of No. 35; 66 of No. 37; 1 of No. 37a; 2 of No. 38; 1 of No. 40; 1 of No. 44; 5 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 54a; 1 of No. 57c; 4 of No. 90a; 2 of No. 111c; 2 of No. 126; 2 of No. 126a; 1 of No. 176; 4 of No. 187; 3 of No. 190; 2 of No. 191; 2 of No. 192.

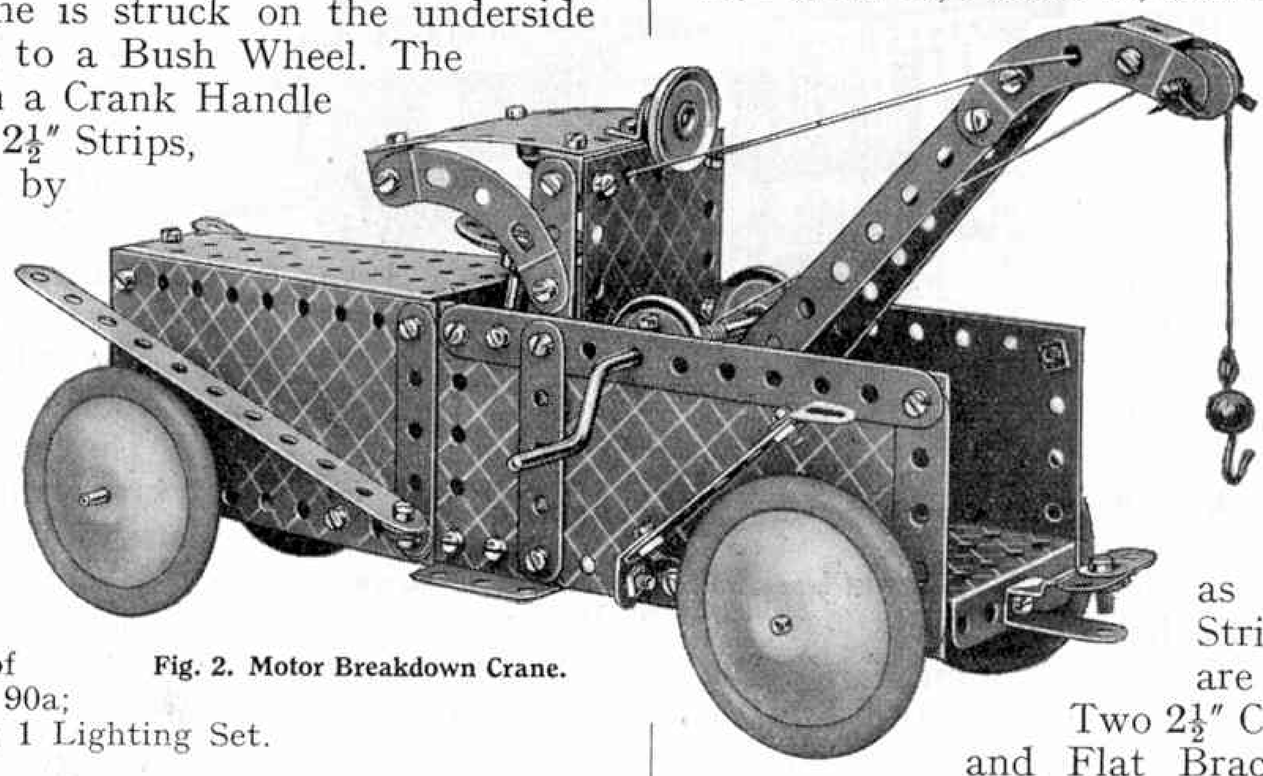


Fig. 2. Motor Breakdown Crane.

Hay Cart

This amusing model shows a novel use for the $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates. The body of each horse is formed by curving a Plate as shown and securing $2\frac{1}{2}$" Strips to Angle Brackets that are bolted inside the Plate. Two $2\frac{1}{2}$" Curved Strips form the neck, and Flat Brackets are bolted to these for the head.

The cart consists of a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate to which are bolted a pair of Trunnions and a pair of Flat Trunnions for carrying the wheel axles. The Plate is mounted with the flanges uppermost and the shafts are bolted to two Double Brackets that are secured to the front

flange. One horse is held in the shafts by a 2″ Axle Rod and Spring Clips, and the front horse is connected to the shafts by lengths of cord that are attached to a 2″ Rod passed through the Flexible Plate.

Parts required for Hay Cart and Horses: 2 of No. 2; 8 of No. 5; 4 of No. 10; 2 of No. 11; 8 of No. 12; 2 of No. 16; 2 of No. 17; 4 of No. 22; 6 of No. 35; 24 of No. 37; 4 of No. 37a; 1 of No. 40; 1 of No. 52; 4 of No. 90a; 2 of No. 111c; 2 of No. 126; 2 of No. 126a; 2 of No. 190.

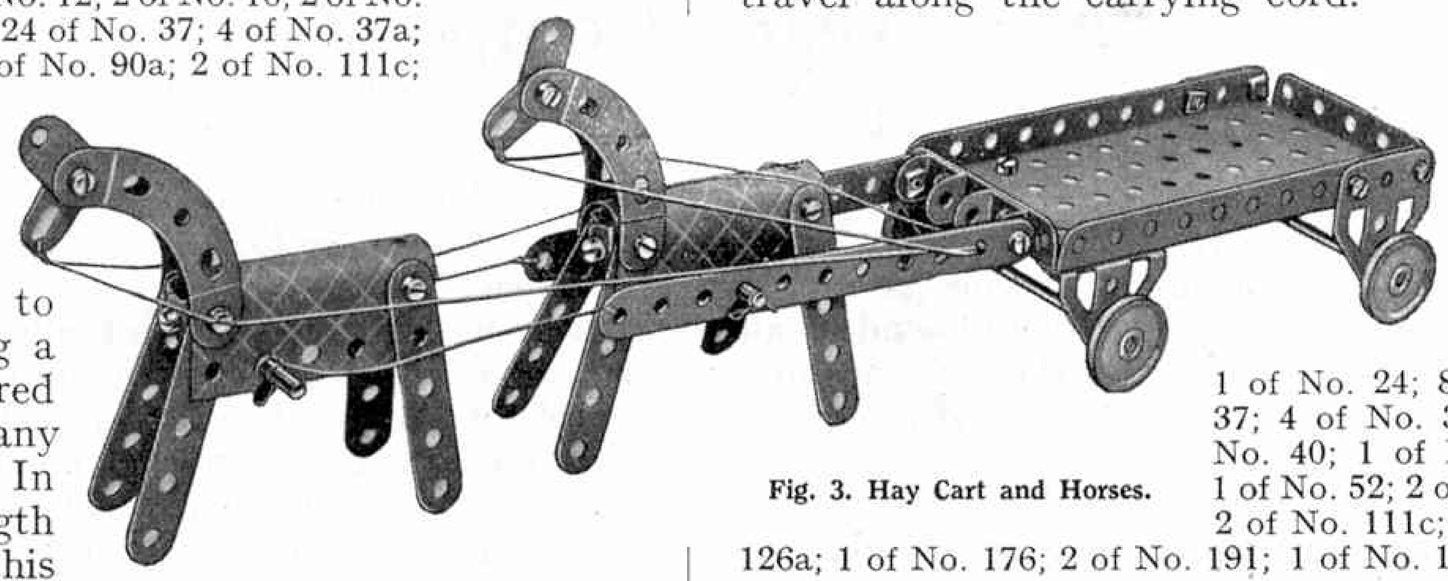


Fig. 3. Hay Cart and Horses.

Telpher Span

In this model the telpher bucket is made to travel to and fro along a cord that can be secured to a wall or post in any convenient position. In Fig. 4 only a short length of cord is shown, but this is for compactness for the illustration.

The $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate at the base carries Angle Brackets that should be screwed down to a baseboard. A $12\frac{1}{2}''$ Strip is bolted to each corner of the Plate and the two front Strips are connected together at the top by a Double Bracket. The rear pair are connected to the front pair in the third holes from the top. The structure so formed is strengthened by a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip at the front, and by $2\frac{1}{2}''$ Curved Strips and $5\frac{1}{2}''$ Strips at the sides. Two crossed $5\frac{1}{2}''$ Strips are fixed as shown, by Angle Brackets. The roof at the rear is formed from a Hinged Flat Plate and is supported by two $5\frac{1}{2}''$ Strips to which it is attached by Obtuse Angle Brackets.

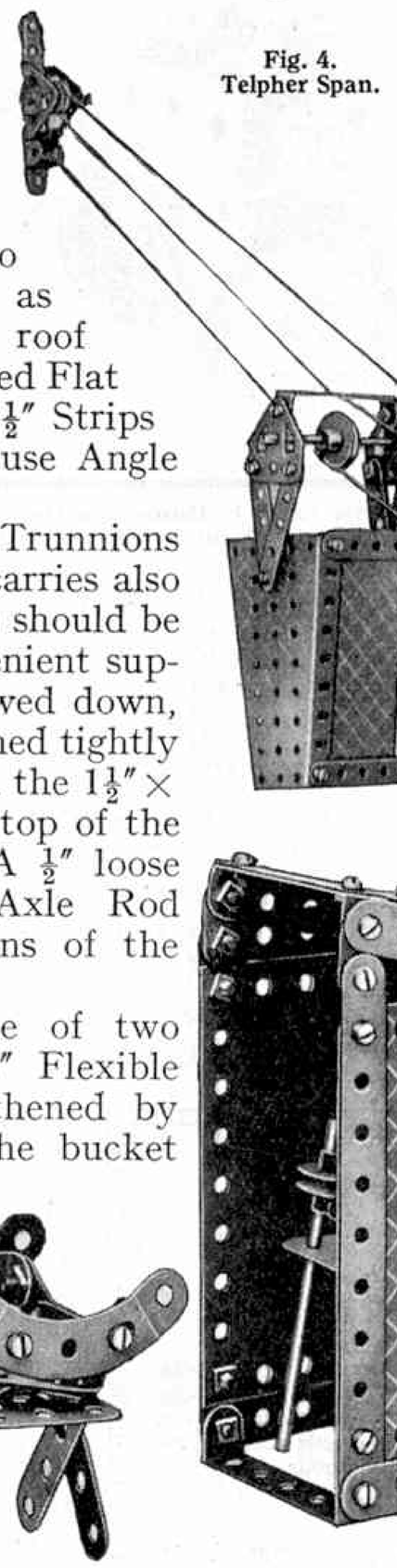
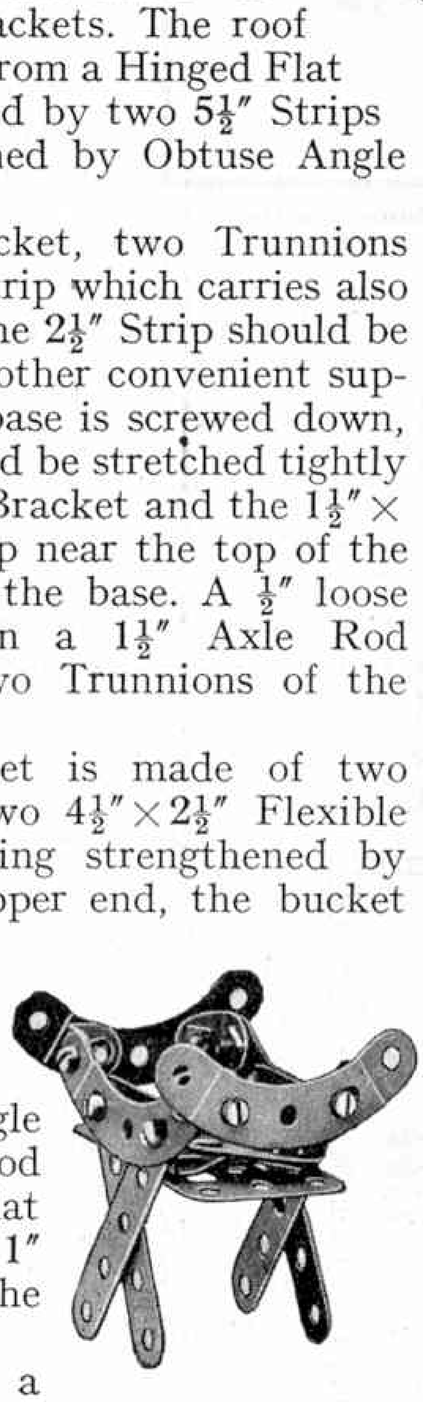


Fig. 4. Telpher Span.

For the wall bracket, two Trunnions are bolted to a $2\frac{1}{2}''$ Strip which carries also a Double Bracket. The $2\frac{1}{2}''$ Strip should be screwed to a post or other convenient support and, when the base is screwed down, a length of cord should be stretched tightly between the Double Bracket and the $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip near the top of the front $12\frac{1}{2}''$ Strips of the base. A $\frac{1}{2}''$ loose Pulley is carried on a $1\frac{1}{2}''$ Axle Rod journalled in the two Trunnions of the wall bracket.

The telpher bucket is made of two Sector Plates and two $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates, the sides being strengthened by $2\frac{1}{2}''$ Strips. At its upper end, the bucket is pivoted to $2\frac{1}{2}''$ Strips attached to Flat Trunnions that are connected by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. A $3\frac{1}{2}''$ Axle Rod journalled in the Flat Trunnions carries a 1″ Pulley that runs on the carrying "rope."



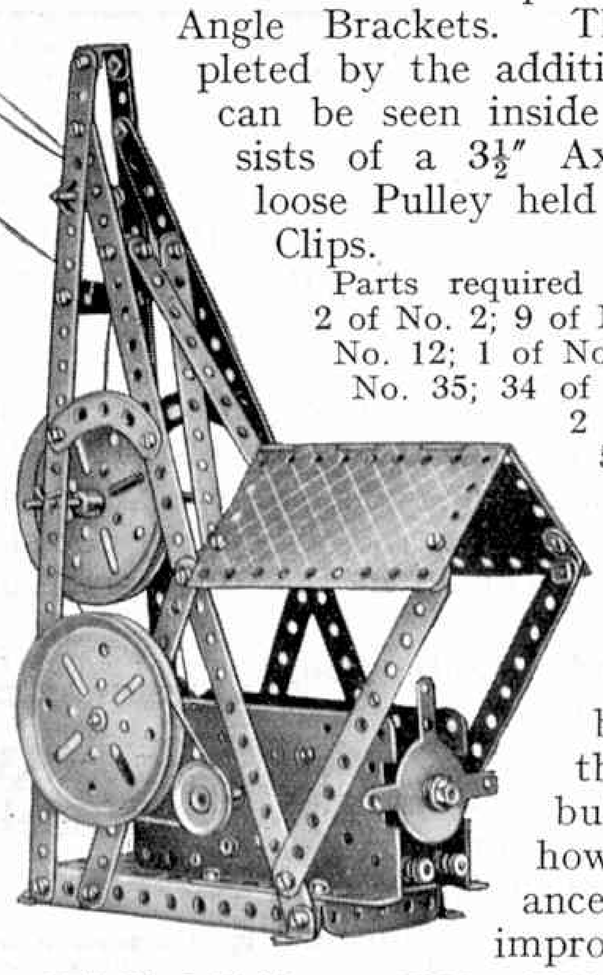
The Motor carries a 1″ Pulley on the armature spindle. This Pulley drives a 3″ Pulley on a Rod carrying a further 1″ Pulley Wheel that drives another 3″ Pulley. The Rod of the latter carries another 1″ Pulley, and cord is passed round this and over an Axle Rod near the upper ends of the $12\frac{1}{2}''$ Strips, and is passed round the $\frac{1}{2}''$ Pulley on the wall bracket. The ends of the cord are tied to the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip of the bucket. When the Motor is set in operation the bucket is made to travel along the carrying cord.

Parts required for Telpher Span: 4 of No. 1; 6 of No. 2; 1 of No. 3; 8 of No. 5; 2 of No. 11; 8 of No. 12; 2 of No. 12c; 3 of No. 16; 1 of No. 17; 1 of No. 18a; 2 of No. 19b; 4 of No. 22; 1 of No. 23; 1 of No. 24; 8 of No. 35; 61 of No. 37; 4 of No. 37a; 7 of No. 38; 1 of No. 40; 1 of No. 48; 3 of No. 48a; 1 of No. 52; 2 of No. 54a; 2 of No. 90a; 2 of No. 111c; 2 of No. 126; 2 of No. 126a; 1 of No. 176; 2 of No. 191; 1 of No. 198; E6 Electric Motor.

Watchman's Hut

The construction of the hut should be quite clear from the illustration in Fig. 5. A $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate forms the back of the hut and has $2\frac{1}{2}''$ Strips bolted to it. The sides are filled in with $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate forms the roof. The $2\frac{1}{2}''$ Strips at the side of the roof are inclined upwards towards the front and their ends are connected to the $5\frac{1}{2}''$ Strips by Flat Brackets. The front Strips are spaced apart by $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. A $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate is secured to the Flanged Plate by Angle Brackets and forms a seat.

The brazier is built up from $2\frac{1}{2}''$ Strips and Curved Strips. A bottom is formed by two Trunnions and two Flat Trunnions, and to the Flange of each Trunnion two $2\frac{1}{2}''$ Strips and a $2\frac{1}{2}''$ Curved Strip are bolted. Further Curved Strips are fixed in place by Angle Brackets. The model is completed by the addition of a poker that can be seen inside the hut, and consists of a $3\frac{1}{2}''$ Axle Rod with a $\frac{1}{2}''$ loose Pulley held in place by Spring Clips.



(Left) Fig. 5. Watchman's Hut and Fire.

Parts required for Watchman's Hut: 2 of No. 2; 9 of No. 5; 2 of No. 10; 6 of No. 12; 1 of No. 16; 1 of No. 23; 2 of No. 35; 34 of No. 37; 3 of No. 37a; 2 of No. 48a; 1 of No. 52; 4 of No. 90a; 3 of No. 111c; 2 of No. 126; 2 of No. 126a; 1 of No. 188; 1 of No. 190; 2 of No. 191.

The models described above show but a few uses for the new Meccano parts, but they serve to show how greatly the appearance of a model can be improved by filling in the open spaces with the Strip Plates or Flexible Plates. Road Wheels and the Hinged Flat Plate are used to advantage in the Motor Breakdown Crane and Telpher Span respectively. The new parts make possible the construction of a greatly increased range of models; and the greater realism obtained, and the increased scope, add much to the fascination and interest of model-building. The new Manuals show a large range of entirely new models.

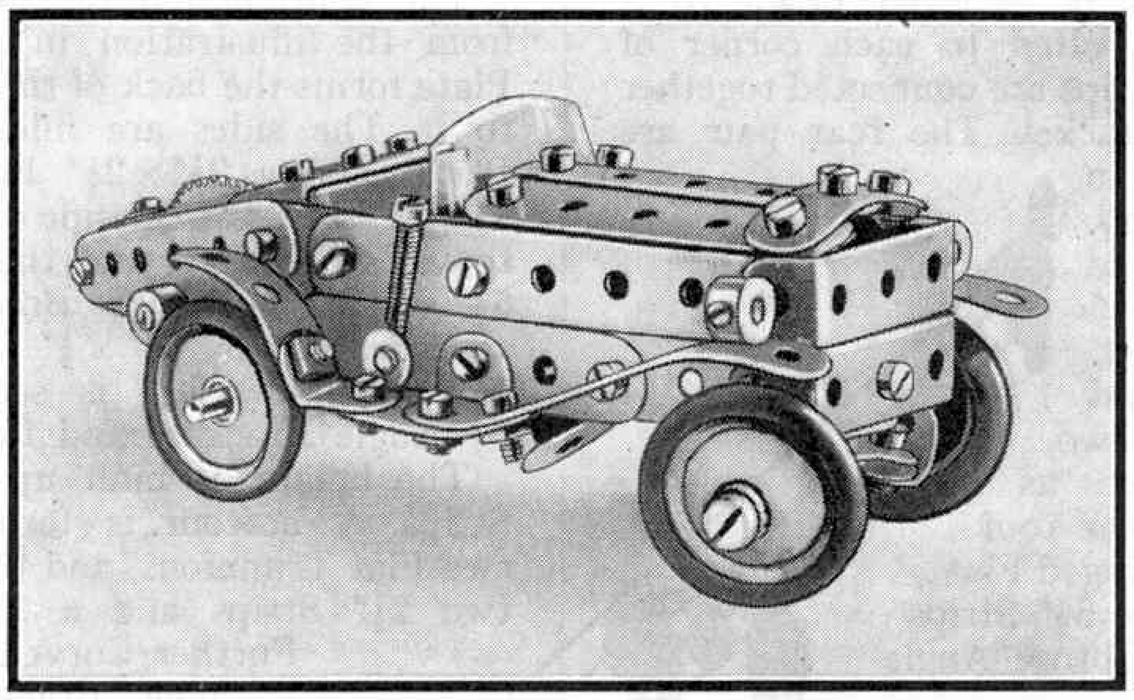
Prizes for Model-Builders

"New Year" Competition

If you own a Meccano Outfit this competition offers you a fine chance to win a prize. If you have won a prize before you may be successful again. If you have not, there is all the more reason why you should send in an entry for this month's contest, for there is nothing whatever to prevent you from winning one of the many valuable prizes listed at the foot of this page, if you set to work right away and build a new and original model.

All you have to do is to think of a new model, no matter how simple, and construct it as neatly as possible. Boys and girls of any age may compete and a competitor may submit more than one model for consideration. No special entry forms are needed and there are no fees to be paid.

You may use any number of parts in constructing the model you wish to enter, but it is a mistake to think that the more complicated a model is, the better the chance you will have of winning a prize. Very often indeed the reverse is the case, and a simple model that is well proportioned, and which displays sound constructional features, secures a prize in preference to a model in the construction of which the chief aim has been to produce an intricate piece of mechanism without any regard either to proportion or correct principles. That is the reason why so many apparently simple models have appeared among the successful entries in recent contests.



A simple model of a sports motor car that won a prize for J. F. Huson in a Meccano model-building competition. It is not necessary to possess a big Outfit to build a successful competition model.

In entering this contest you should try to be as original as possible in your choice of a subject, for in making the awards the judges will pay special attention to models showing initiative and which are not simply variations of models included in the Meccano Manuals of Instructions.

There are thousands of interesting subjects for you to choose from, but if you cannot think of a really original model try to incorporate in your car, aeroplane, locomotive or other model a new use for a Meccano part or a little detail work so that the finished model is as realistic as possible.

All models submitted must, of course, be new. That is, models must not be copied from the Meccano Instruction Manuals or other Meccano publications.

Entries will be divided into three Sections as follows: Section A for readers living in the British Isles and over 14 years of age. Section B for readers living in the British Isles and under 14 years of age. Section C for readers of all ages living overseas.

We wish to remind intending competitors that it is not necessary to send the actual model; a good photograph or a clear drawing is all that is required. Please take special care to see that your age, name and address appear on the back of each photograph or sheet of paper used, together with the letter A, B or C, indicating the Section in which you are entering the model, and the name of the competition, i.e. "New Year" Model-Building Contest. Photographs or drawings need not be your own work, but it is absolutely necessary that the model itself is your own unaided work.

If your model incorporates any special mechanical or structural features that are not brought out well in your photographs or drawings, be sure to include with your entry a short description that will make everything clear. The descriptions should be as short as possible consistent with lucidity.

Address the envelope containing your entry to "New Year" Model-Building Contest, Meccano Ltd., Binns Road, Liverpool 13. It should be noted that drawings or photographs of prize-winning models become the property of Meccano Ltd., but unsuccessful entries will be returned if a stamped addressed envelope of suitable size is enclosed with the entry.

Readers living in Great Britain and Ireland must forward their entries so as to reach Liverpool not later than 30th March, 1935. In order to give overseas entrants plenty of time in which to build their models we have extended the closing date for Section C to 31st May, 1935.

The full lists of prize-winners will be published in the *"M.M."* as soon after the closing dates as possible, and all successful competitors will be notified personally by letter. A selection of the prize-winning models will be described and illustrated in a future *"M.M.,"* and if suitable will be included also in forthcoming Meccano Manuals.

A prizewinning model from a past model-building contest is illustrated on this page. The model is only a very simple one, but it earned a prize for its neat and solid construction.

1935 "New Year" Model-Building Contest

The Prizes

The prizes in Sections A and C are as follows:
First Prize: Meccano or Hornby Goods value £3-3s.
Second Prize: Meccano or Hornby Goods value £2-2s.
Third Prize: Meccano or Hornby Goods value £1-1s.
Eight Prizes of Meccano or Hornby Goods value 10/6.
Eight Prizes of Meccano or Hornby Goods value 5/–.
Certificates of Merit.

In Section B the prizes are:
First Prize: Meccano or Hornby Goods value £2-2s.
Second Prize: Meccano or Hornby Goods value £1-1s.
Third Prize: Meccano or Hornby Goods value 10/6.
Eight Prizes of Meccano or Hornby Goods value 5/–.
Eight consolation awards of Meccano or Hornby Goods value 2/6.
Certificates of Merit.

Launching Device for Ships' Lifeboats

Another Inventor Makes Use of Meccano

THE task of launching a ship's lifeboat in a heavy sea is difficult and dangerous, and only too frequent are the occasions on which it ends in disaster, the boats being smashed before reaching the water, and the occupants thrown into the sea, often with little hope of rescue. One of the chief sources of trouble is the rolling of the vessel, which causes the boats first to swing outward while being lowered from their davits, and then to crash back against the side of the ship. It is possible for the lifeboats along the whole of one side of a vessel to be put out of commission on account of the ship taking a heavy list. In such a case the remaining boats, even if they can all be launched without mishap, are unlikely to provide sufficient accommodation for all persons on board.

Mr. J. Hore, of Liverpool, has spent several years in experimenting with a view to finding some means of successfully launching lifeboats in all conditions. He is himself a seafaring man, and from his personal experience and observation he has devised an ingenious arrangement to prevent boats from being damaged before reaching the water, and also to enable them to be launched even when the ship has a heavy list. It is interesting to note that in working out the device, for which he has taken out provisional patents, the inventor made use of Meccano parts. The Meccano model illustrated on this page demonstrates clearly the proposed method of operation.

The essential features of the apparatus are the guide rails and two sliding units that grip the side of the boat to prevent it from swinging away from the ship's side. The guide rails normally lie parallel to the ship's deck, but can be lowered in a few moments to the perpendicular position ready for the lifeboat to be lowered. In the model, the guides consist of $9\frac{1}{2}''$ Strips that are shown folded away in Fig. 1. They are pivoted on $\frac{1}{2}''$ Bolts, one in the end hole and the other in the second hole from the end; and the outer ends of the Strips rest on Angle Brackets. They are prevented from slipping off by $\frac{3}{4}''$ Bolts passed through the Strips and screwed into the bosses of Threaded Cranks at the rear of the Plates forming the ship's side. These Bolts serve also as locking pins when the guide rails are in position for use.

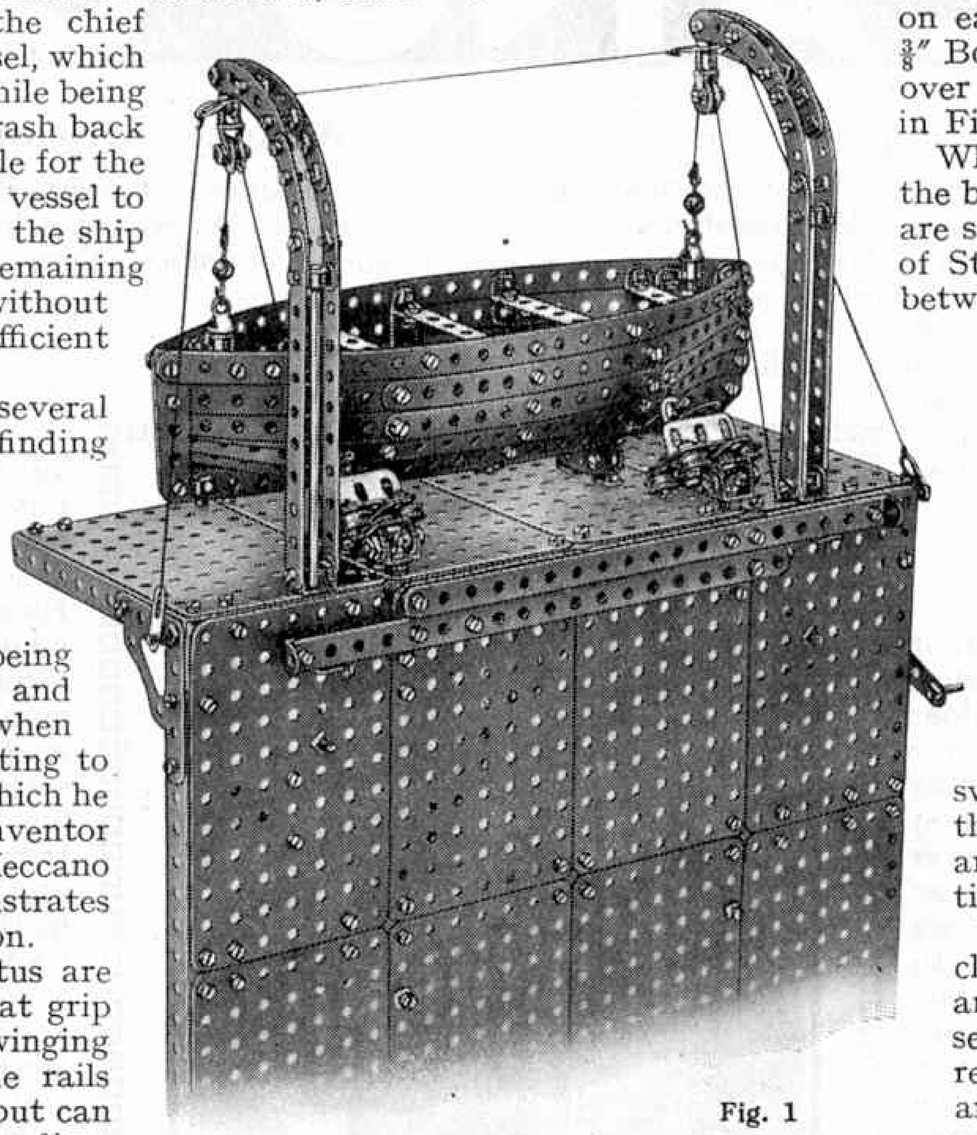


Fig. 1

Fig. 2 shows the guides in their perpendicular position with the lifeboat ready to be lowered. Special clips have been devised to hold the rails to the ship's side, and also to prevent fore-and-aft swinging motion when the vessel pitches badly. In the model these consist of Flat Brackets bolted near the lower ends of the Strips and bent like Reversed Angle Brackets, each with a piece filed away to admit the shank of a bolt. The slots face outward when the rails are perpendicular, and fit behind the heads of bolts each attached to the Flat Plates by two nuts. The heads of the bolts hold the rails to the ship's side, and whichever way the vessel pitches one of the bolts takes the strain and prevents to-and-fro movement of the lifeboat.

The sliding units are each built up by bolting together two $1\frac{1}{2}''$ Corner Brackets to form a square flat plate, and at each corner is a long Bolt on which a $\frac{1}{2}''$ loose Pulley is free to rotate. At the other side of the plate a $1\frac{1}{2}''$ Angle Girder is fixed and the bolts holding this also secure a $1\frac{1}{2}''$ Strip. The purpose of this Strip is to clamp a short length of Spring, cut from Part No. 43, carrying a $1'' \times \frac{1}{2}''$ Angle Bracket. The Angle Brackets on each sliding member are provided with $\frac{3}{8}''$ Bolts, and these form the clips that hook over the side of the lifeboat, as shown in Fig. 2.

When the davits are swung inboard and the boat rests on its chocks, the sliding units are stowed on deck on short rails consisting of Strips, as seen in Fig. 1. The rails fit between the pairs of Pulley Wheels, and a stop is fitted on the end of each. Pivots are arranged so that the rails can be raised until their outer ends are brought into line with the upper ends of the guide rails down the side of the ship.

To launch the boat the locking pins, $\frac{3}{4}''$ Bolts, are removed from the guide rails, which are lowered from the horizontal to the vertical position. The locking pins are reinserted to hold the rails in place. Meanwhile the boat is being raised clear of its chocks and swung outward. It is then lowered until the gunwale is just below the deck level, and the sliding units are lowered by tipping up the short rails.

The lower illustration shows how the clips fit over the gunwale of the lifeboat, and in actual practice they would be held secure by pins. As soon as the boat reaches the water the pins are removed and the sliding members unhooked. They are prevented from dropping off the ends of their rails by stops, so that they can be hauled back again later if necessary, or re-engaged with the boat for raising it. It will be observed that, although the boat is held to the ship's side throughout its descent, it is not secured rigidly. The springs allow flexibility for the boat, and absorb any sudden shocks that may be imposed upon it by the movement of the ship.

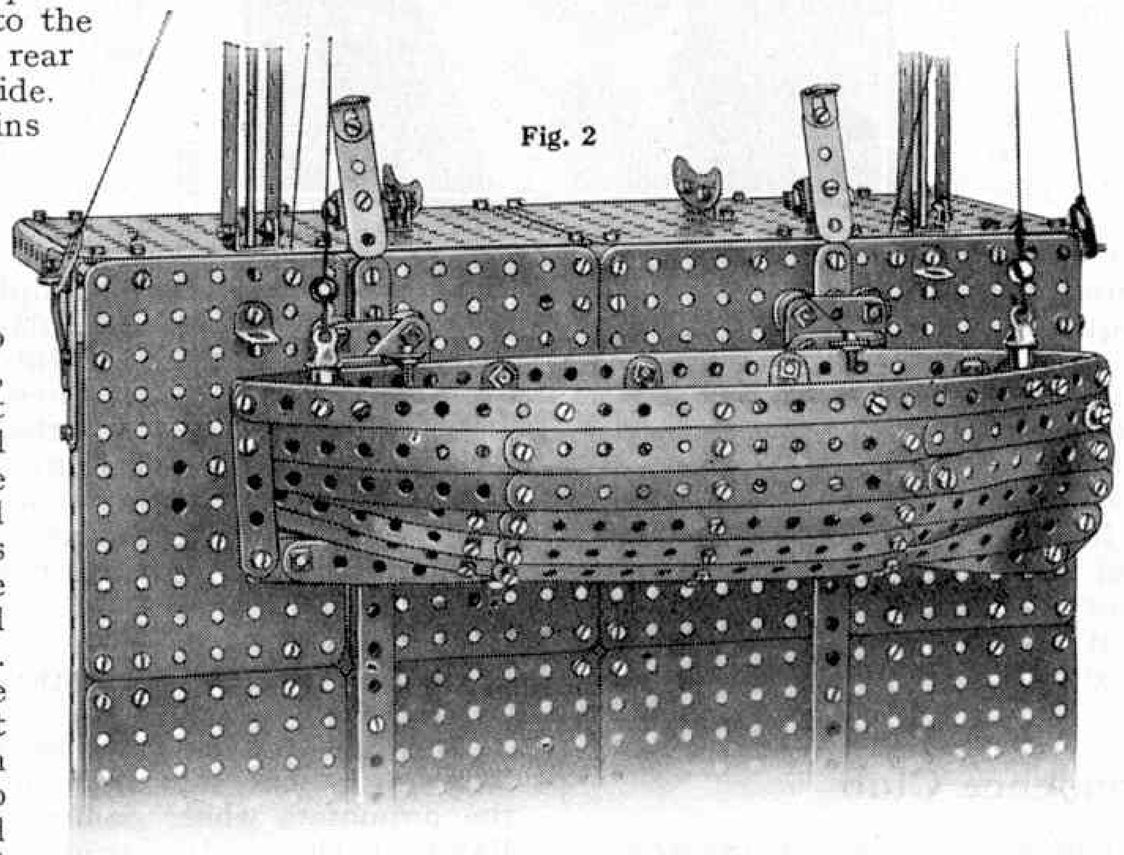


Fig. 2

Time is an important factor when a lifeboat is being launched, as it may be essential for the vessel to be abandoned in the shortest possible time, or the boat may be needed to go to the assistance of a person who has been washed overboard. Very little time is occupied in arranging the guide rails and guides in position, and these operations can be carried out simultaneously with the raising of the lifeboat from its chocks and swinging it outboard.

If the ship has a list, the boats can still be launched, provided that they can be swung into position over the ship's side. The guide rails and slides prevent them from fouling the plates.

Since the preparation of this article and the accompanying illustrations, the inventor has carried out certain modifications to the arrangement. Instead of the sliding units being housed on the short tip-up rails on the outboard side of the lifeboat, they are transferred to fixed rails on the deck, and slide under the boat, to be stowed on the inboard side. This avoids the possibility of damage being done by heavy seas breaking over the deck.



New Year Greetings

It is with great pleasure that I wish members of the Meccano Guild a Happy and Prosperous New Year. Membership of the Guild and of Meccano clubs grows more quickly now than any other time, for many boys become acquainted with Meccano during the Christmas and New Year season and learn for the first time of the fun that association with other enthusiasts brings with it. I give a cordial welcome to all newcomers and assure them that I shall do my best to ensure for them the greatest enjoyment from their hobby.

Room for New Clubs

Looking back over the past year, I cannot help feeling gratified by the progress that the club movement has made. The older clubs are stronger, and their activities cover a wonderfully wide range of pursuits that are helping to fit boys for making the best of things in work and play; and the newer clubs are showing encouraging promise. Unfortunately, the pleasures of club life are still denied to many Guild members. In scattered districts this often is unavoidable, and in these cases lone members must continue to rely upon correspondence with me, and with other Guild members through the medium of the Correspondence Club, for the friendship that the Meccano Guild brings with it. In many centres the time is ripe for the establishment of Meccano clubs, however, and every Meccano enthusiast who is not within easy reach of the headquarters of an existing club should talk over with his friends the possibility of forming a new one. In this he should not be deterred by the thought that he cannot immediately form a large club with great resources. Some of the largest and most successful of Meccano clubs have had very humble beginnings and provided the right spirit is there, as much fun can be obtained from meetings of a few friends in their own homes as from the operations of a large club with well-equipped headquarters.

I am particularly interested in small friendly clubs, and I hope that the founders of any organisation of this kind, however small it is, will write to let me know what they are doing in order that I may help them. One way in which I can do this is to include notices of their meetings in the *"Club Notes"* page. This is not reserved for affiliated clubs and I shall be only too pleased to include in it reports of the proceedings of newly-formed clubs and thus to give them publicity that will help to secure recruits.

Join the Correspondence Club

The Correspondence Club also has made excellent progress during 1934. Entries have been on a record scale and many promising friendships have been formed through the medium of this organisation. New members of the Guild particularly should think over the advantages that the Correspondence Club has to offer, and I shall be pleased to forward a copy of the necessary entry form to any member who is interested.

Meccano Club Leaders

No. 78. Mr. E. W. Sykes



Mr. E. W. Sykes was the founder of the Malvern (Johannesburg) M.C., and has been Leader during the greater part of the club's existence. Model-building Evenings, Concerts, Games, Rambles and Sports Meetings are included in the programme and the club is remarkable for the splendid Exhibitions and Sales of Work that have been arranged in aid of charities.

A South African Club with a Great Record

The Malvern (Johannesburg) M.C. was founded in April, 1921, by Mr. E. W. Sykes, who except for a brief interval has been Leader ever since. There were then only 12 members, but the attractive programmes arranged gave these such enjoyable times that recruits quickly flowed in and to-day the club is a large and successful organisation with 80 members, of whom 30 are in the Girls' Section.

In its early stages the club was associated with the Malvern Wesleyan Church, but in 1932 the connection was severed and the club began an independent career in which it has been increasingly successful. Its record is one to be proud of. Nearly 200 members have passed through it since its formation and the programmes they have enjoyed have included a splendidly varied succession of model-building meetings and social and athletic events. Full support has been given to other clubs in Johannesburg and district, and officials and members of the Malvern M.C. played leading parts in the formation of the Transvaal Meccano Club Union, the purpose of which is to encourage the formation of new clubs, and generally to develop the spirit of the Meccano Guild and to pursue its aims and objects.

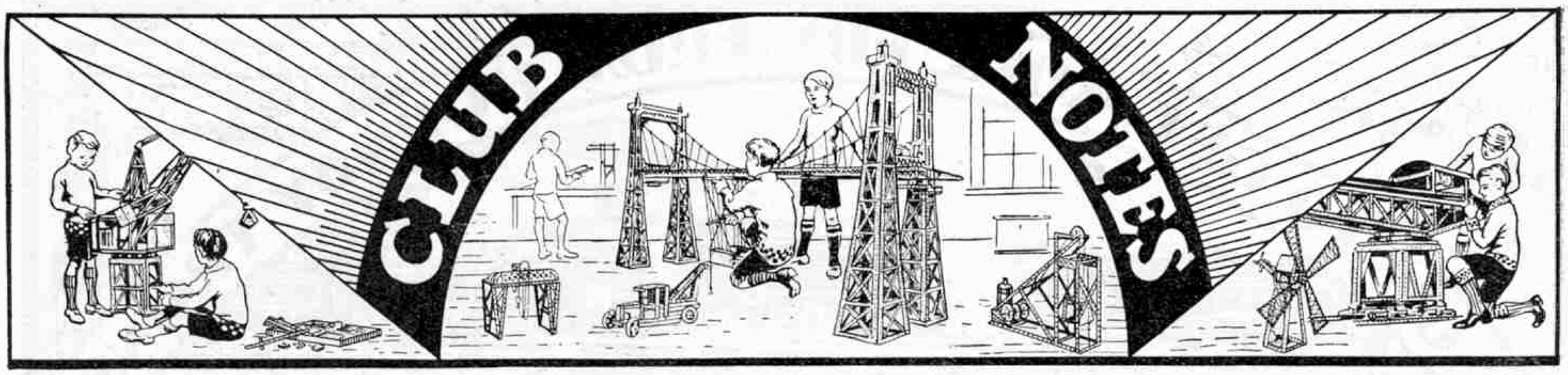
A special feature has been made of charitable work. In its lifetime the club has raised £450 for purposes of this kind, and the personal efforts and hard work of members in this direction, together with their constant endeavours to foster friendship and manliness and to encourage the growth of team spirit, recently called forth well deserved commendation from a Johannesburg newspaper of wide circulation.

In discussing the reasons for its progress, the Leader points out that members have been encouraged to regard the club as their own and have always accepted a full share of the responsibility for its success. He emphasises the value of the spirit of comradeship that has prevailed throughout the club's history, and has enabled it to tide over dark periods. This is referred to by others who have been members for lengthy periods and have held official positions, and these agree that the example of the Leader himself has been a very important factor in creating pride in the club and determination to make it one of the best in the world.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested should communicate with the promoters whose names and addresses are given below:

BATH—J. Denby, 11, Sansdown View, Combe Down.
GATESHEAD—T. Souter, 98, Rectory Road, Bensham.
HOLLAND—J. Burger, Breestraat 86, Beverwijk.
MACCLESFIELD—A. Morlidge, 4, Blagg Street.
REDHILL—P. I. Neale, "South Court," London Road.
STALYBRIDGE—N. Shaw, 31, Lindsay Street.
WARLINGHAM—W. H. Griffith, Fir Croft, Succumbs Hill.



Wednesbury and District M.C.—Interest of members is stimulated by competitions between the "Nuts" and "Bolts," and a small shield is to be awarded to the more successful section. A large model workshop has been built and an attractive Table Tennis Tournament has been held. "*Nuts and Bolts*," the club magazine, is a bright production, the most recent issue including articles on "*Birmingham's Reservoirs*," "*The America's Cup*" and "*How Matches are Made.*" A Lantern Lecture on "*British Railways*" has been given by the secretary. Club roll: 11. *Secretary:* A. L. Morgan, 17, Cobden Street, Fallings Heath, Wednesbury.

Tynecastle School (Edinburgh) M.C.—Good progress is being made with model-building operations. Hallow-'een was celebrated by a very successful party, at which each section of the club in turn acted a charade. One of the members created a record by securing 20 apples in 20 seconds when "dooking," or "ducking," began! A visit has been paid to the Dalry Engine Sheds. Club roll: 35. *Secretary:* R. A Forsyth, 41, Caledonian Crescent, Edinburgh.

Dagenham M.C.—Busy times are being enjoyed by members and two new sections have been formed for Juniors and Girls respectively. Three groups have been formed for model-building and other purposes, and the winning group at the end of each month arranges the meetings for the following month. An enjoyable evening was spent in electrical demonstrations, a shocking coil arousing special interest. The club has given a Concert, with separate afternoon and evening performances for children and parents respectively, and an excellent Exhibition also has been held. Club roll: 54. *Secretary:* P. Bush, 121, Church Elm Lane, Dagenham, Essex.

Exeter M.C.—Encouraging enthusiasm continues to be reported and a high standard of model-building skill is being maintained. Recent models built include a heavy "Scammell" Lorry, a reproduction of the Cunard White Star liner, "*Queen Mary*," and various cranes, bridges and motor vehicles. The Cycling Section continues to meet regularly, members priding themselves on being "all the year round" cyclists. Club roll: 35. *Secretary:* D. Legg, 25, Chute Street, Newtown, Exeter.

Worcester Y.M.C.A. M.C.—A very satisfactory report on the first year's work was presented at the Annual Meeting, when officials for the year were elected. An attractively varied programme is now being followed. Junior members meet on Tuesdays and Fridays, and senior members on Saturdays, for Model-building, Wireless, Gymnastics and Games. A Prize Fund scheme is being given careful consideration by the officials. Club roll: 12. *Secretary:* R. J. Baker, "Avondale," Lowell Street, Worcester.

Kendal M.C.—Great efforts to provide interesting and attractive meetings are being made. Model-building Evenings have been varied by Games Nights, and an enjoyable Concert and Cinematograph Show have been arranged. Model-building work has been organised in preparation for an Exhibition. Several new members have been enrolled, and other Meccano boys interested in club work will be heartily welcomed. Club roll: 10. *Secretary:* Mr. L. Haslam, Middleton, Kirkby Lonsdale, Carnforth.

Old Charlton M.C.—A "Serial Story" provided an interesting evening. Each member in turn contributed to this, continuing until he felt that his instalment was becoming uninteresting, when it was continued by the next member on the list. The complete story is reported to have been "weird and wonderful," and the experiment caused great amusement. Special subjects, such as cranes, workshops, vehicles of the future and aircraft are being dealt with on Model-building Evenings and splendidly varied entries are being received. A Cinematograph Show has been given by one of the members and enjoyable visits have been paid to the United Glass Bottle Manufacturers' Works, and a large Dairy and Bakery. Club roll: 22. *Secretary:* W. Jaques, 60, Gurdon Road, London, S.E.7.

Corner House (Corsham) M.C.—Members are showing great keenness and enthusiasm, and met at each other's houses for successive meetings while trying to find a suitable club room. Entries in Model-building Contests are built at home, and are judged and discussed at meetings by the President and Vice-President. At one meeting a special prize was awarded to the youngest member of the club for an excellent model of a railway truck and buffer stop. Splendid Lantern Lectures have been given on Railways and Aeroplanes, and a particularly interesting talk on "*Egypt*" was given by Mr. N. D. Carter. A Lending Library for home reading has been formed, and a club magazine is now published. Models recently built by members have included a timber truck, several cranes and aeroplanes, and an anti-aircraft gun. Enjoyable games have been played at the end of several meetings. Members particularly enjoy charades. Club roll: 21. *Secretary:* R. Bidmead, High Street, Corsham.

Whitgift School M.C.—An excellent series of practical meetings have been held, at which members have been busy constructing a variety of models, including an efficient wax modelling machine that was specially attractive to members. A visit was paid to the works of Trojan Ltd., where spot welding and ordinary welding processes were watched. The operation of a planing machine and examination of a cut away Trojan car showing the working of the pistons, gears, etc., were very interesting features. Club roll: 48. *Secretary:* J. A. Watson, 23, Addiscombe Avenue, Croydon.

Sutton Valence M.C.—Members are diligently practising model-building, chiefly in preparation for a "New Model Contest." Two Meccano Outfits have been secured for club use and a Hornby Train Section also is being formed. Experimental talks on "*Air Pressure*," "*Water Pressure*," "*Electricity*" and "*Fireworks*" have been given. A Football Team has been formed and made an excellent show in its first match, against the rest of the school. Club roll: 16. *Secretary:* C. G. Ledger, Little Belringham Farm, Sutton Valence, Nr. Maidstone.

Holy Trinity (Barnesbury) M.C.—An excellent display of models by junior and senior members and a Hornby Electric Railway planned on a very large scale were the central features of the club's 15th Annual Exhibition. A realistic model of an aerodrome was constructed for use in association with the railway layout and other attractions included frequent Cinema and Lantern Lectures; a Handicrafts Stall on which objects constructed by members of various sections of the club were displayed; a fine Art Gallery that included the "*Latest portrait of King George V*" by S. T. Amp, a picture of A. Bea by H. Oney, and other astonishing works of art; and a Refreshment Buffet. The increase in membership has made a reorganisation necessary and the club's affairs are now to be governed by a Committee of Control. Club roll: 65. *Secretary:* J. A. W. Hines, 331, Liverpool Road, Islington, N.1.

South Parade Modern School (Cleckheaton) M.C.—Membership has increased satisfactorily and members are keenly interested in Model-building and Hornby Train Evenings. The models built have included cranes, motor cars and bridges. A Kodascope Show has been given by the secretary. Boxing Matches are now being arranged. Club roll: 22. *Secretary:* K. Walker, 12, George Street, Cleckheaton, Yorks.



A happy group of members of the Ipswich M.C. with their Leader, Mr. W. Sheppard, in camp at Southwold. This club was affiliated in February, 1930, and the summer camp usually arranged helps to develop a splendid spirit of comradeship. Concerts in which the club orchestra plays a great part, Exhibitions and other social events add to the enjoyment of club life.

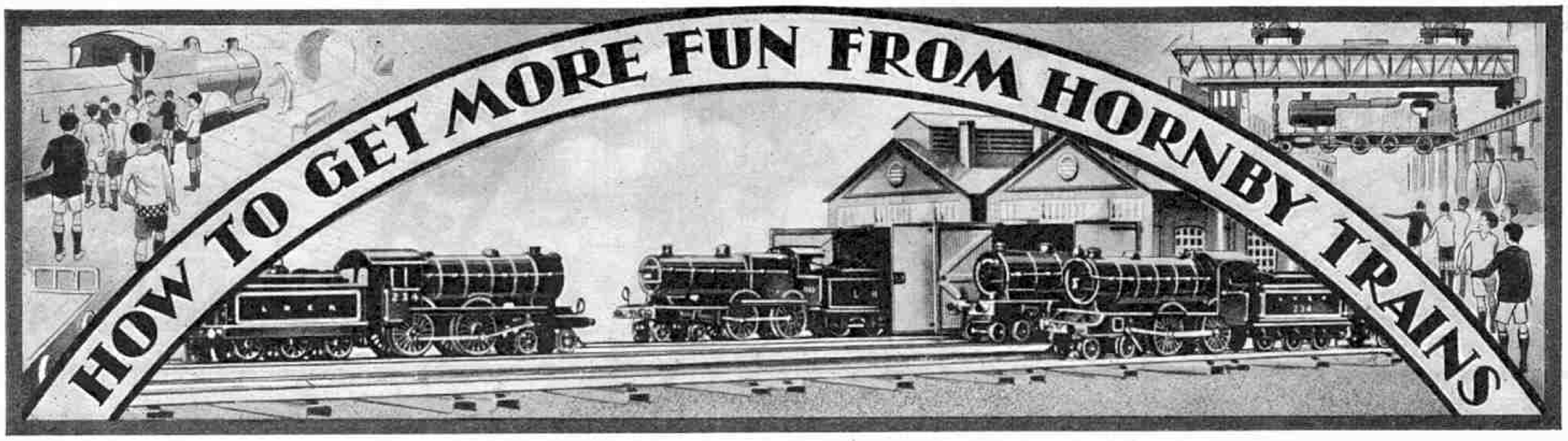
NEW ZEALAND

Wellington Boys' Institute M.C.—Excellent models built by members were displayed in the window of J. S. Land Ltd., Wellington, and a proportion of the prizes awarded was contributed by successful members to the club funds. Guest Night attracted a large attendance. A special invitation programme was typed for this event, and a display of models, games and refreshments ensured a splendid evening. Merit Medallions awarded to members were presented by Mrs. Bayland. The club room is closed for a short period during summer, and indoor meetings are to be resumed on 2nd March with an interesting new programme of lectures and Model-building Contests. Club roll: 15. *Secretary:* E. H. Spears, 70, Cuba Street, Petone.

SOUTH AFRICA

Malvern M.C.—The usual excellent programme of Model-building Evenings, Rambles and other events has been followed and has included a specially interesting visit to the Johannesburg Signalling Cabin. Great enthusiasm prevailed at the Prize-giving Social. The musical programme was provided by members and prizes were presented by Mr. Dall. The "Ramblers" won the Sports Shield, and tied with the "Rangers" for the Cup presented for club work. The Leaders of the two sections caused great amusement by walking up together to receive the Cup, and returning with each holding one of the handles. The Treasurer's report surprised many visitors by revealing the extent of the charitable work carried on by the club. Club roll: 80. *Secretary:* A. Hubbard, P.O. Box 8, Cleveland, Johannesburg, South Africa.

Pioneer (Pietermaritzburg) M.C.—This club ,the first established in South Africa for coloured boys, is now well established and excellent Model-building meetings are being held. Affairs are conducted by members themselves, the Chairman and secretary being elected by them, and a visit by Mr. E. Sykes, Leader of the Malvern (Johannesburg) M.C., has given great encouragement. A Boys' Brigade has been organised by the club. Club roll: 10. *Secretary:* A. H. Alley, 461, Burger Street, Pietermaritzburg.



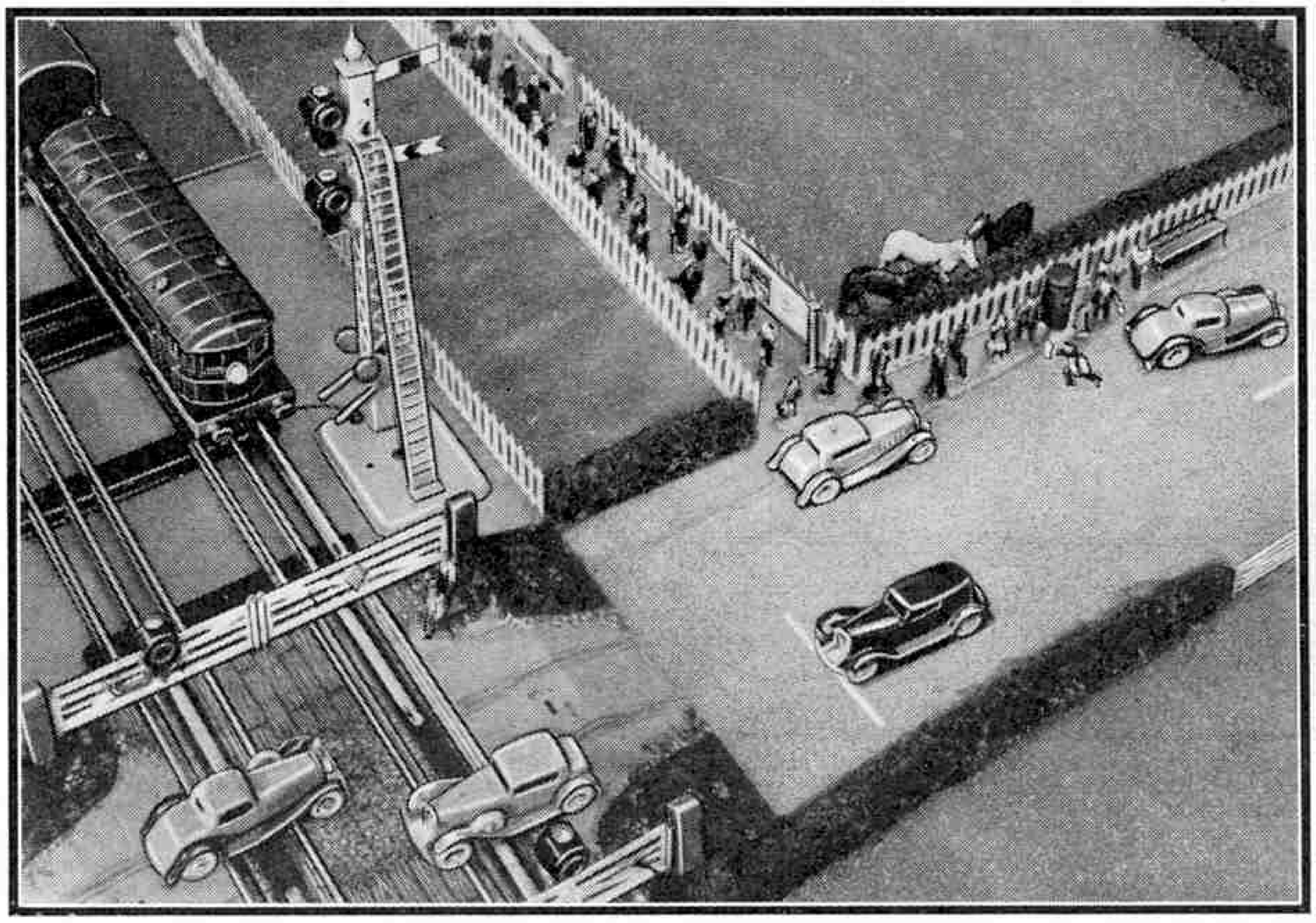
LXXIV.—HORNBY ELECTRIC RAILWAYS

IN previous articles we have referred in detail to Hornby Electric Railways, but important developments that have been made this season make it desirable to return to the subject.

It is often thought that miniature railways that are electrically operated require expensive and complicated apparatus in order to secure a satisfactory power supply for the working of the trains. Actually this is far from being the case with the modern Meccano and Hornby equipment that is available. If there is a house mains supply available, and this is alternating current, the operation of a Hornby Electric Railway by means of a Meccano Transformer is a simple and definitely safe plan. Meccano Transformers are scientifically designed and constructed, and their insulation is tested at a pressure of 2,000 volts. Full details of the various types will be found in the current Hornby Train catalogues.

There are two voltage systems in use for Hornby Electric Trains, the 20-volt and the 6-volt. The 20-volt is more efficient electrically, and as the 20-volt Locomotives are essentially for Transformer operation, those who have an alternating current mains supply should adopt the 20-volt system without hesitation. A great advantage is that the more important Locomotives of the 20-volt series incorporate a special mechanism by which they can be reversed from the lineside, merely by switching off the current and quickly switching it on again. This is in addition to the usual control of speed. When it is remembered that the switching on and off of the current to the track, and the control of speed, are effected by manipulation of the speed regulator mounted on the T20A and T20 Transformer, it will be realised that the action of a single lever carries out starting, stopping, control of speed and reversing. This is a very useful arrangement and one that makes for convenience in handling and realism in operation.

With these automatic reversing locomotives it is possible to carry out train movements practically without handling the train at all. Hornby Rolling Stock is fitted with automatic couplings that engage when two vehicles are pushed together, so that a complete train can be assembled without any actual touching by hand either of the locomotive or of the stock. When used in conjunction with the Hornby Control System for signals and points, the operations on a layout appear almost to be carried out as if by magic. The locomotives fitted with automatic reversing mechanism include the famous "true-to-type" Hornby 4–4–0 No. 2 Specials and the well-known 4–4–2 No. 3 engines. The smaller 20-volt locomotives do not incorporate automatic reversing mechanism, but they can be reversed by manipulation of a lever in the cab, except for the EM120 and EM220 Locomotives, which are intended only for simple layouts and therefore are not arranged to reverse.



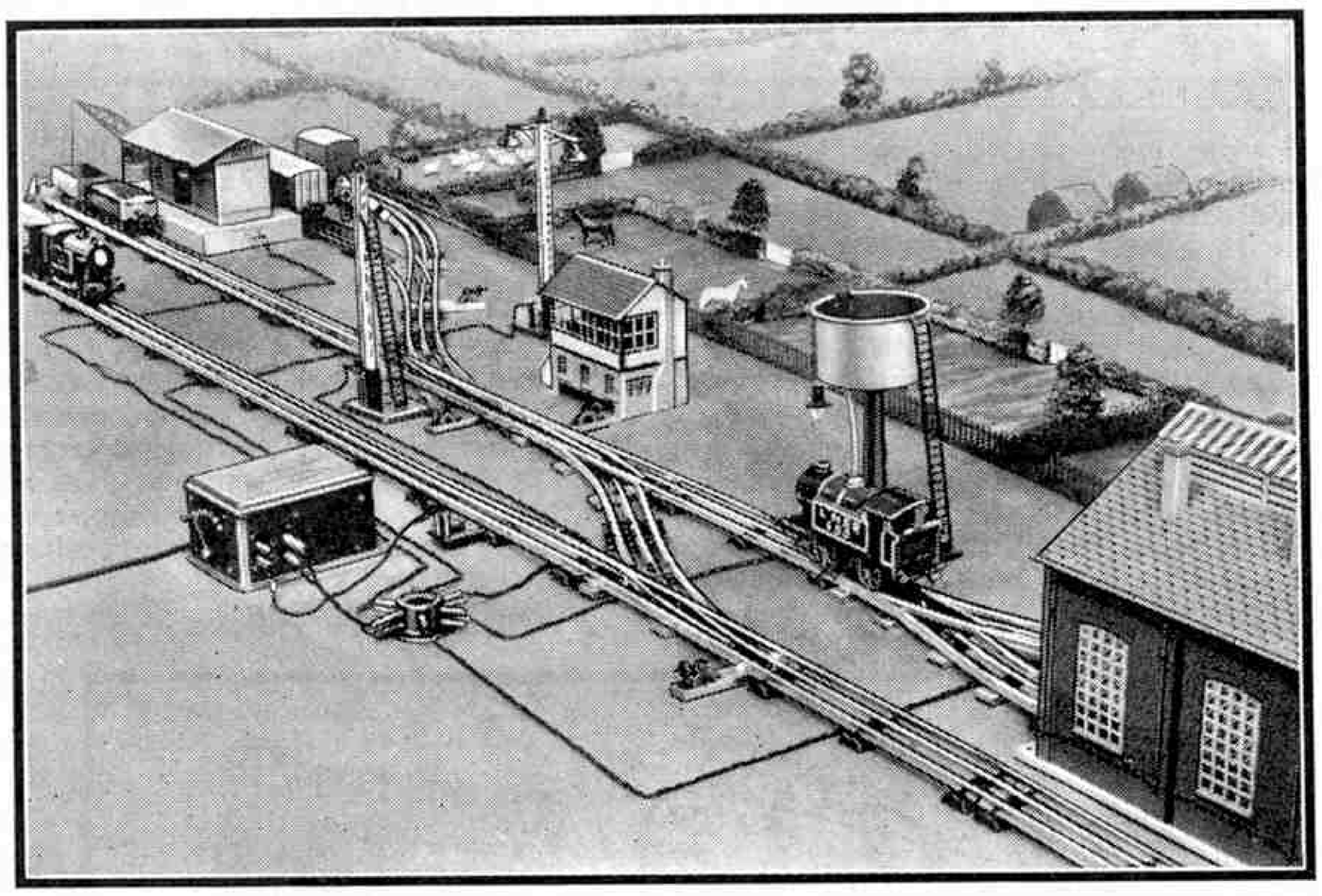
An unusual view of a Hornby electric layout, showing the Level Crossing and Double Arm Signal as fitted up for electric lighting. Very extensive use is made of Dinky Toys in this illustration.

Where there is no alternating current mains supply available, a Transformer cannot be used. The 20-volt system is therefore out of the question, and the 6-volt system must be adopted, a 6-Volt Accumulator forming the power supply. Speed control is then effected by the inclusion of a Resistance Controller in the circuit.

After a 6-volt railway system has been installed and operated by means of an accumulator, because there is no suitable mains supply, it sometimes happens that an alternating current supply becomes available. In that event there are suitable Transformers that can be substituted for operating any of the 6-volt locomotives

except one without the necessity for purchasing new engines.

This exceptional locomotive is the Hornby EPM16 Special Tank that cannot be operated by means of a Transformer. Its permanent magnet motor requires low voltage direct current, so that ordinarily an accumulator would be the only possible source of power. A special Hornby Transformer-Rectifier has now been introduced to enable an alternating current mains supply to be used. The Transformer-Rectifier is a composite instrument that reduces the voltage of the alternating current mains supply, and then converts it to direct current suitable for the Permanent Magnet motor of the EPM16 Special Tank. The Hornby Transformer-Rectifier cannot be used to operate any of the other 6-volt Hornby Electric Locomotives.



An interesting photograph showing how the various connections are made from a Meccano T20A Transformer to the track and, through a Distribution Box, to the electrically-illuminated accessories. The Distribution Box is close to the Transformer and several Flexible Leads are plugged into it.

The EPM16 Special Tank is exceptional in another and very useful respect. It can be reversed by reversing the direction of the current passing to the track, so that it alone of all Hornby 6-volt Locomotives can be reversed automatically and completely controlled from the line-side. A special Reverse and Resistance Control Switch is manufactured for this Locomotive, reversing and speed variation each being controlled by a separate lever.

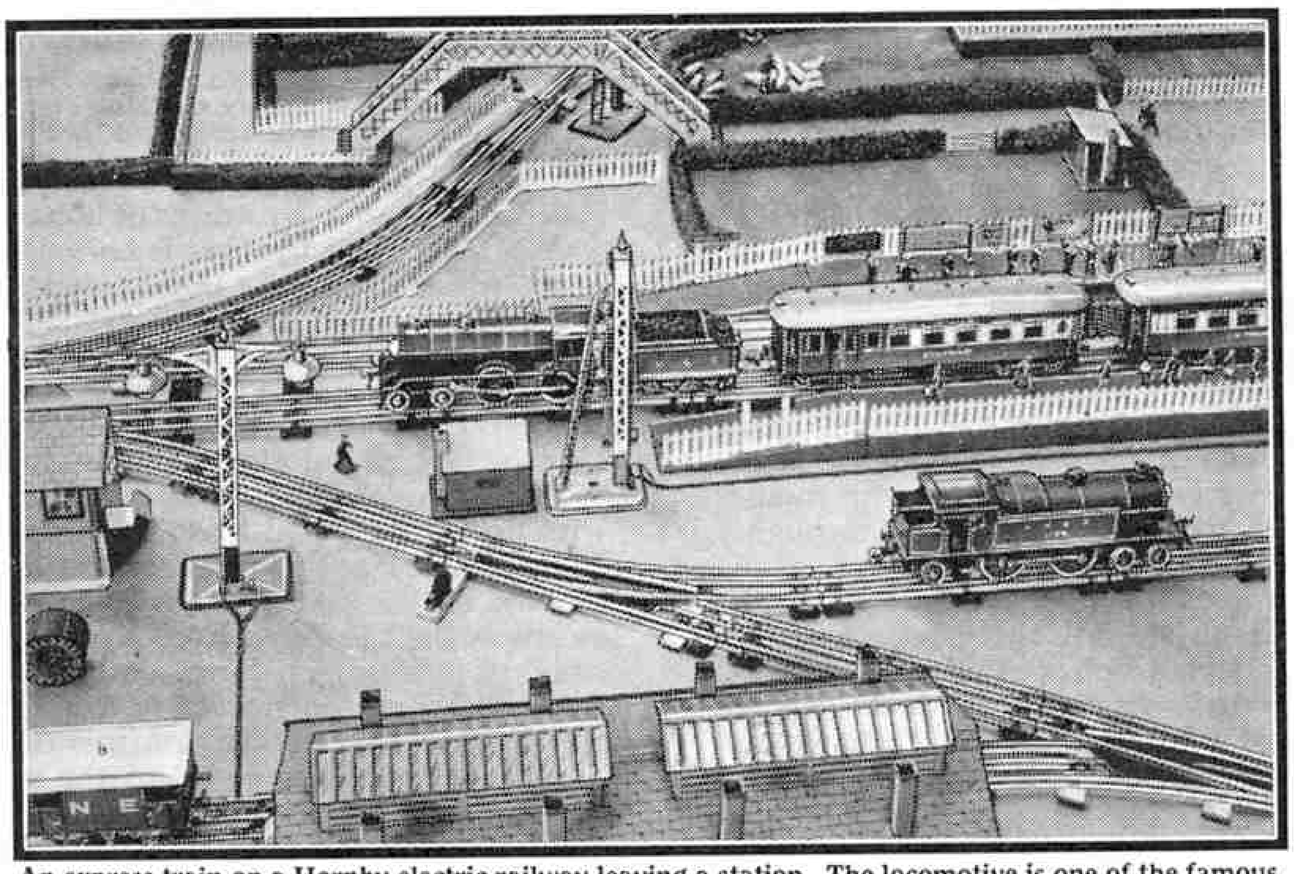
The controllability of this engine makes it ideal for shunting work on a 6-volt layout, for local passenger and goods service, and for all the miscellaneous "runabout" jobs that fall to the lot of small tank engines in actual practice.

The Hornby Electric System does not stop at the provision only of suitable electric locomotives and the means of operating them. Many of the important accessories are now available fitted for electric lighting. These include signals of the ordinary Single-Arm type, Junction and Double-Arm Signals and the Signal Gantry. By their use the twinkling "ruby and emerald" effect seen after dark on actual railways can be attractively reproduced in miniature. Level Crossings, too, are protected with "danger" lamps to warn trains or road traffic, according to the position of the gates. Buffer Stops are suitably fitted with red lamps to indicate the end of the track or siding to which they are fitted.

Shunting yards and railway premises generally can be lit by means of Single and Double Lamp Standards, and Signal Cabins, Stations and Engine Sheds are fitted for illumination. It is thus possible to operate a train in a darkened room by means of the accessory lights alone, and the effect of this is very fascinating.

The connection of all these accessories is carried out in a simple manner by means of special Flexible Leads, which have plug and socket fittings to correspond with the various accessories and Transformers. Each of the T20A and T6A Transformers includes a special lighting circuit giving current at $3\frac{1}{2}$ volts in addition to, and independent of, the train-driving circuit. Thus the brilliancy of the lamps of illuminated accessories does not vary with the position of the speed regulator, but is maintained at a constant pitch. The use of $3\frac{1}{2}$ volts for this lighting circuit was decided upon in order to enable ordinary flashlamp bulbs to be used.

The method of connecting the Transformer to the various accessories is interesting. In the first place a Flexible Lead connects the Lighting Circuit of the Transformer to an accessory known as the Distribution Box. In addition to the connection from a Transformer, five other Flexible Leads can be plugged into one Distribution Box, and so complete the connection between the Transformer and the accessories to be illuminated. If there are more accessories than can be provided for by means of one Distribution Box, a second one can be connected to the first, and the remaining accessories wired-up as before. The maximum number of accessories that can be connected to the lighting circuit is 14 in the case of the T20A Transformer, and 18 for the T6A.



An express train on a Hornby electric railway leaving a station. The locomotive is one of the famous 4-4-0 EM220 Specials and is fitted with a motor having automatic reversing mechanism.

Very little attention is required to keep Hornby Electric Locomotives in good running order, but the instructions with regard to lubrication and general upkeep, packed with each Locomotive and Train Set, should be carefully followed.

Model-Building Contest Results

By Frank Hornby

June "Simplicity" Competition

Simple models constructed with as few parts as possible seem to have considerable attraction for Meccano model-builders, a fact that is reflected in the large number of entries for the "Simplicity" Competition announced in the June 1934 issue of the *"M.M."* It may be thought that little skill is required to build a model of this kind, but this is very far from being the case. It certainly is easy to bolt together a few Strips and other parts and call the finished article a "model," but it is quite a difficult matter to build a simple model possessing the essential qualities that make for realism. It is this that accounts for the continued popularity of the simplicity competitions with experienced model builders, who usually are the most enthusiastic participants in these contests.

So far as originality and realism is concerned the models entered in the June contest are quite equal to any submitted in previous contests of this type, and the prizewinners may justly feel proud of their success.

The full list of awards in both the Home and the Overseas Sections of the Contest are as follows:

Home Section

First Prize, Meccano or Hornby Goods value £2-2s.: H. Davies, Swansea. Second Prize, Goods value £1-1s.: S. May, Leigh-on-Sea, Essex. Third Prize, Goods value 10/6: J. Francis Jones, Manchester 14.

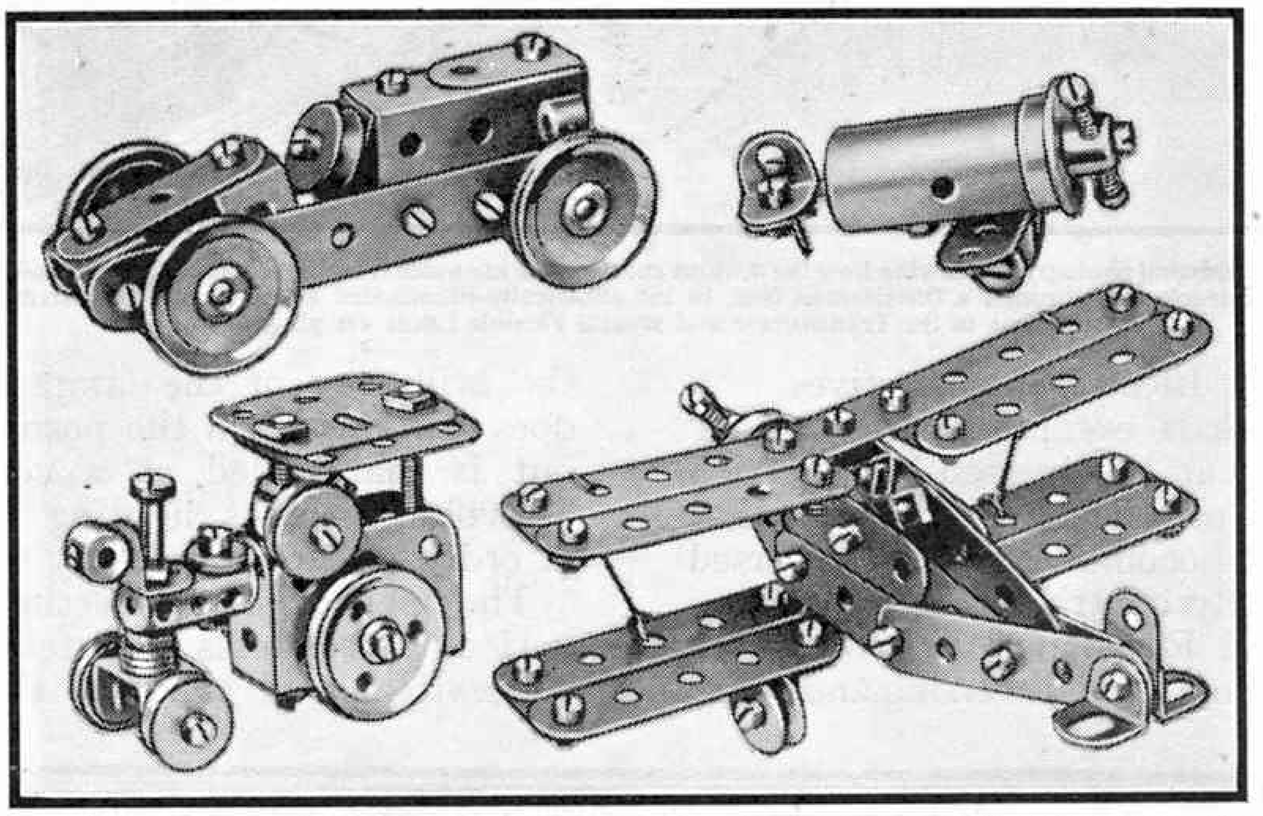
Ten Prizes of Meccano or Hornby Goods value 5/–: P. Bayly, Plymouth; R. Chatfield, Eastbourne; A. Gater, Bridport; T. Green; Mapperley, Notts.; T. Grieve, Edinburgh; J. Kennett, Richmond, Surrey; A. R. Pickering, Haxby, Nr. York; H. Renyard, London, S.E.13; D. Vickery, Manchester; C. Wrayford, Moretonhampstead, Devon.

Consolation Awards of Meccano or Hornby Goods value 2/6: L. Davies, Birmingham; D. Rawles, Taunton, Somerset; H. Tapsfield, London, N.3; J. Tottle, Taunton.

Overseas Section

First Prize, Meccano or Hornby Goods value £2-2s.: R. Cain, Durban. Second Prize, Goods value £1-1s.: H. Mountfort, Ohakune, N. Zealand. Third Prize, Goods value 10/6: A. Ness, Port Dalhousie, Ontario.

Ten Prizes of Goods value 5/–: J. Harris, Natal, South Africa; H. Carpenter, Timmins, Ontario, Canada; D. Graham, Alberta, Canada; A. Lewin, Toronto, Canada; J. Rodriguez, Montreal, Canada; A. Coppola, Sliema, Malta; J. Gill, Invercargill, N. Zealand; B. Kennedy, Christchurch, N. Zealand; K. McCullough, Dargaville, N. Zealand; K. Orams, Blenheim, N. Zealand.



Four ingeniously constructed models that won prizes in the "Simplicity" Competition. The biplane was built by H. Davies, Swansea, and the low wing monoplane by S. F. May, Leigh-on-Sea. The tractor and the sports motor car are the work of R. Cain, Durban, South Africa, and J. F. Jones, Manchester, respectively.

The illustrations on this page show three of the prizewinning models in the Home Section and one of the principal entries in the Overseas Section, and it will be seen that although the models consist of only simple parts, they are neatly built and thoroughly realistic in appearance.

The First Prize in Section A was awarded to H. Davies for the fine model biplane illustrated. Each side of the fuselage of this model is made from two Flat Brackets, which are bolted to each end of a Double Bracket, and at their ends are connected to 1½″ Strips. A 2½″ Strip is then bolted to the end hole of one of the 1½″ Strips, and a 2″ Strip to the centre hole of the other 1½″ Strip on each side. The free ends of the 2″ Strips are bolted to the centre holes of the 2½″ Strips.

The wings are each made from a 5½″ Strip with two 2½″ Strips held to it by Flat Brackets, and they are secured to Double Brackets bolted between the sides of the fuselage. The upper wing is spaced from the Double Bracket that holds it in place by three Washers. Short lengths of cord are used for the interplane struts. At the tail end the Strips of the fuselage are joined together, and a Flat Bracket and two ½″×½″ Angle Brackets represent the fin and tail-plane respectively.

A ½″ fast Pulley, with ½″ Bolts screwed into its boss, is bolted to the front Double Bracket of the fuselage to represent the propeller and engine. The landing wheels are ½″ loose Pulleys attached to the lower mainplane by means of ½″×½″ Angle Brackets.

Second Prize was also awarded for a model of an aeroplane built by S. F. May. The prototype of this model was illustrated in the November 1933 *"M.M."* The main details of the model are as follows. A ⅜″ Bolt is pushed through one of the end holes of a Sleeve Piece. A 2½″ Strip is next placed on the bolt to represent the wing, and is held in place by means of a nut. The undercarriage is composed of a Collar and is fixed in position on the bolt that holds the wing in place by two ⅜″ Bolts screwed into its tapped bores. The bolts are fitted with Collars that form the landing wheels.

A ¾″ Flanged Wheel is pushed over one end of the Sleeve Piece as shown to make the engine cowling, and two ½″ Bolts screwed into its threaded holes, hold a Bolt in position in the boss to represent propeller blades.

A Flat Bracket is fixed inside the open end of the Sleeve Piece by means of a ⅜″ Bolt, and is spaced from the Sleeve Piece by four Washers. The Flat Bracket supports the tail unit, which consists of a second Flat Bracket fitted with two ½″×½″ Angle Brackets.

A fine little model of a racing car brought success to J. F. Jones. A Channel Bearing is used for the bonnet, and a 3½″ Strip bolted to each side of the Channel Bearing provides the chassis. At their other ends the Strips are connected by a Double Bracket, to which is bolted a 1½″ Strip also fitted with a Double Bracket as shown. A 1″×1″ Angle Bracket bolted to the front end of the Channel Bearing is used for the radiator, and the bolt by which the Angle Bracket is held forms a realistic radiator filler-cap. The headlamps are Collars fixed in place on each side of the bonnet, by means of bolts screwed into their tapped holes.

A ½″×½″ Angle Bracket is bolted inside the Channel Bearing and is fitted with a ½″ loose Pulley, which represents the steering wheel. Each of the wheel axles is a 1½″ Rod, which is pushed through the 3½″ Strips of the chassis and fitted with 1″ fast Pulleys for wheels.

The traction engine illustrated is the work of R. Cain, an overseas competitor. The model is very simply constructed and it will be seen that in this model also a Channel Bearing is used to good effect.

The Channel Bearing forms the body of the model and is fitted with two 2″ Threaded Rods held in position by two nuts. One of the Rods fixes a 1″×½″ Angle Bracket in position. A Collar, to which a ½″ loose Pulley is attached by means of a ⅜″ Bolt, is held in position on one of the Threaded Rods by means of its Grub Screw, and a Flat Bracket is clamped down against the Collar by a nut. The Flat Bracket is bent downward and is fitted with a Washer and a nut and bolt to imitate the controls of an actual traction engine. A Threaded Pin is screwed into the upper hole of the 1″×½″ Angle Bracket already referred to, and it holds a Coupling that forms the boiler. The funnel is made with a Pivot Bolt screwed into one of the tapped holes of the Coupling. The Pivot Bolt also holds a ½″×½″ Angle Bracket in position on top of the boiler, and this supports a Collar that represents the dynamo. A Double Bracket, which is held in place on the Coupling by means of a ⅜″ Bolt, is spaced from the Coupling by Washers and fitted with two ½″ loose Pulleys held on ⅜″ Bolts.

The Second and Third Prize models in the Overseas Section are an aeroplane fitted for torpedo carrying, and a small electrically operated power hammer, a horizontal reciprocating electric motor and a railway wagon. The plane is the work of H. V. Mountfort and the other models were sent by A. F. Ness.



Branch News

CENTENARY (GOOLE).—The Branch track is altered from time to time, but usually represents the L.N.E.R. main line from London to Edinburgh. The greater part of the layout is composed of single track, but passing places are provided at Newcastle, York, Doncaster and other intermediate stations, and the trains are timed to make good use of these. Members visited York for a special Railway Exhibition in aid of charities, and a visit was paid to the L.N.E.R. Locomotive Sheds at Hull. Heck, Selby and other stations on the L.N.E.R. East Coast main line are visited regularly. Secretary: P. Heslehurst, 1, Airmyn Avenue, Centenary Road, Goole.

ST. THOMAS (EXETER).—Membership is increasing satisfactorily and the club is holding splendid track meetings. At an Open Night many famous express passenger trains were run on the track, and the proceeds mounted to 10/–. Members organised a special display in connection with a Bazaar. Trains were run without a hitch and attracted interested attention from visitors. The track is steadily being improved by the introduction of branches and the installation of improved signalling methods. A second Open Night was as successful as the first, and members greatly appreciated the attendance on these occasions of the Leader and secretary of the Elmside Branch. At one of these meetings the breakdown train of the Elmside Branch, kindly brought on loan by Mr. J. Blaker, was put to excellent use in dealing with derailments. Secretary: H. A. C. Adams, "Westwood," Buckerel Avenue, Exeter.

WARDEN HOUSE.—An excellent Branch track has been developed and is being continually extended as new members join. Every entrant is asked to provide a number of rails and thus the track is enlarged in order to provide railway duties for all. Schemes for electrifying the track are now being considered. Secretary: H. M. Anderson, Rathgael, 22, Laura Grove, Paignton.

HARLESDEN.—The first task of members on resuming meetings for the winter sessions was to overhaul the track and rolling stock. An excellent non-continuous layout was then developed. This has a branch line and at least two trains are running at any time during operations. A scheme of reorganisation has been planned in order to make working even more interesting and enjoyable. Secretary: J. P. Summers, 11, Radcliffe Avenue, Harlesden, London, N.W.10.

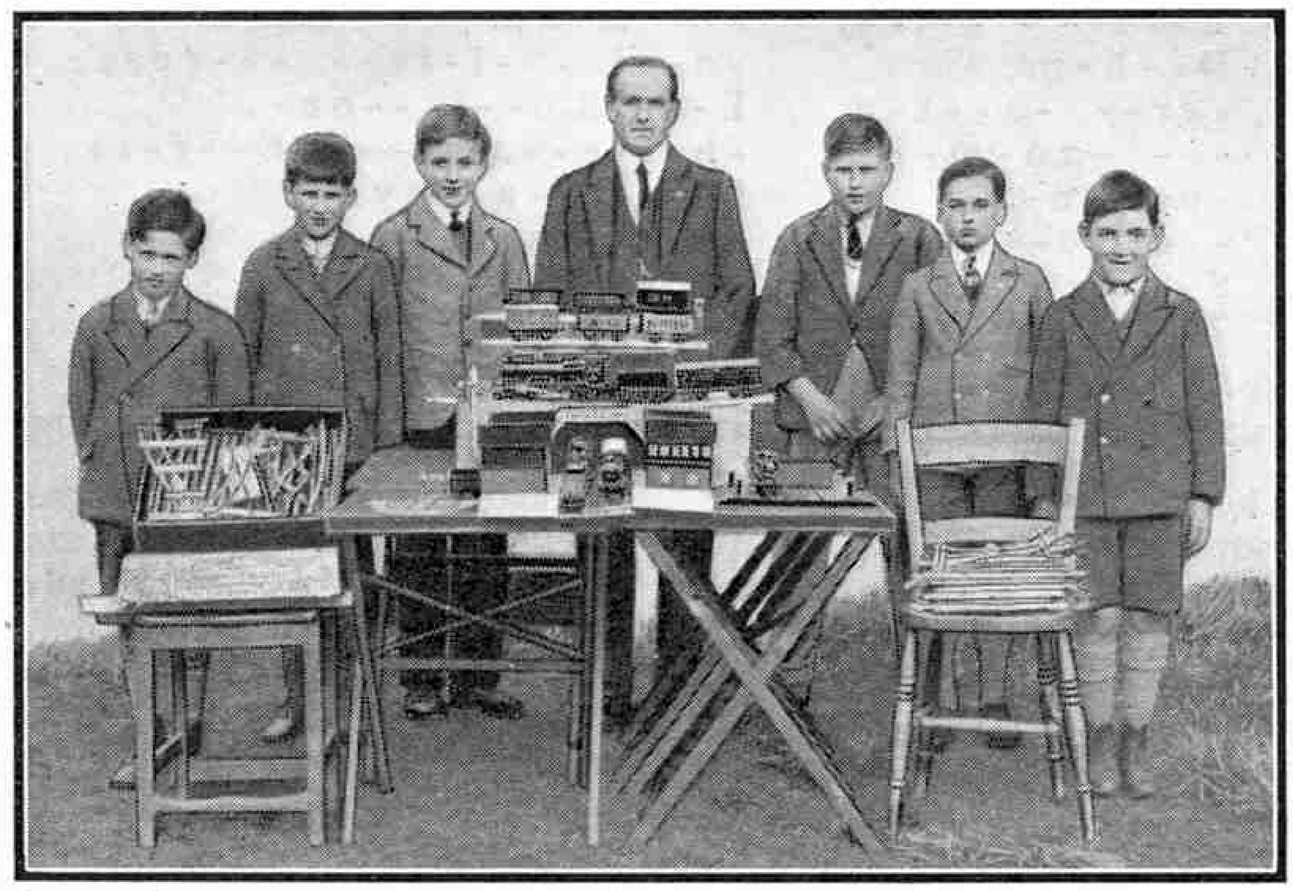
GLENGORSE (BATTLE).—Excellent track meetings have been held by members of this newly incorporated Branch. Several layouts have been tried and the speed of the Hornby "Royal Scot" made it necessary to enlarge the track. Special attention was given to providing a layout on which this engine could be run with advantage. Operations were carried out to timetable throughout, and the H.R.C. Senior Booklet proved helpful to members in making plans for enjoyable working. Two excellent Cinematograph Films have been displayed, one of these being *"The Wrecker."* Secretary: A. G. Forsyth, Glengorse, Telham Court, Battle, Sussex.

SOUTH BIRMINGHAM.—The permanent layout planned by the Branch is now complete and electrification has commenced. A new terminal station has been provided and this was officially opened during a Publicity Week held in December. A Junior Section is to be formed if a sufficient number of new members can be obtained, and all who are interested are requested to write to the secretary. Track meetings that promise to be increasingly attractive have been planned and a visit is projected to an excellent model railway, from which many useful hints no doubt will be obtained. Secretary: E. Sharp, 156, All Saint's Road, Kings Heath, Birmingham 14.

NEW SOUTHGATE.—Excellent track nights have been held and a special meeting was devoted to Railway Competitions of various kinds. On certain track nights timetables worked out by members were tried. A Lantern Lecture on *"London"* has been given by the secretary, the slides being kindly loaned by the L.N.E.R., and other Lantern Lectures are to be arranged. Secretary: A. R. Wardle, 25, Limes Avenue, New Southgate, London, N.11.

HOLYWELL.—Excellent practice was obtained with the garden railway, part of which had to be relaid with a double track in order to accommodate the trains run on it. The track has now been brought indoors and excellent meetings are being held, the layout being steadily developed as equipment is added to the branch resources. A Branch magazine has been published and bureaux for general information and the exchange of railway photographs have been opened. The General Information Bureau provides members with working details of engine sheds, signal cabins and other railway features. Lantern Lectures and talks on railway subjects have been given, and visits have been planned to the Oxford and Didcot Engine Sheds. Secretary: J. Spicer, 28, Holywell, Oxford.

KIDDERMINSTER.—The Branch track is 600 ft. in length and 23 locomotives are available for use on it. There are six working sections, each of which is assigned to a group of members. Visits have been paid to the G.W.R. Sheds and Works at Kidderminster, and to the local Gas Works, where members climbed to the top of the 200 ft. gas holder. Secretary: E. Haines, Railway House, Prospect Hill, Kidderminster.



A group of members of the Crockenhill Branch, No. 265. Chairman, Mr. B. Reeves, who is seen in the centre of our photograph; Secretary, C. V. Reeves. This Branch was incorporated in May of last year. An excellent layout has already been developed and operations on it are becoming more enjoyable as it is extended and improved.

Branches Recently Incorporated

278. BROOKFIELD—N. McD. Lowe, Friends' School, Wigton, Cumb.
279. CAMPDEN GRAMMAR SCHOOL—E. R. Ridgway, The Grammar School, Chipping Campden, Glos.
280. ADDISCOMBE—C. Chandler, 62, Ashburton Avenue, Addiscombe, Croydon.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

MISSING LINKS CONTEST

The popularity of hidden words contests seems to increase with each competition announced. It is evident that our readers enjoy applying their railway knowledge and general ingenuity in tracking down the hidden words, and there is no doubt that there is great fascination about such contests. This month we announce a *"Missing Links Contest."* It is a considerable time since a similar contest was announced on this page, and therefore we shall expect to receive a large entry.

In the panel in the centre of this page are 32 mutilated names that consist of the names of well-known locomotives, stations and trains. Various letters have been omitted, and are represented by dashes, and H.R.C. members are set the pleasant task of identifying the names. There is no catch in any of the words, and in spite of appearances each will be found to form part of the name of a locomotive, station or train.

C a - - i - l - .	B - i - - o - .
- - e r - o - i - n .	- r e - o - e - e - d .
C - - - - a m e r - - .	- a m - g - t - .
W - e - - a - .	- - a n - t - u - l - - - - i - i t - d .
N o - w - c - .	- i - g - d - a - - - 1 1
- - - S - - - a - .	- . - . P . - o - f e - s - - n .
- e t e - - - r o - - - .	- i - - l - s - - o - - - .
E - - t e - - - - l l - .	- - - B - a m - - - - o o - .
D - - h - m .	- o - - i - - - i - i e - - - - r e s s .
- e r - - - a - - t - n .	L - - - C o - - i - - - o o - .
- - - - a n - m - n .	- h - l - e - - a m - - - E - - r - s s .
- n - e - n - - - .	H - n - - - a - - e y .
- - e - o - - - - - o - .	- o - e c - m - e .
S - - - e .	- - e e - P - i - - - p a .
T - - b a - - - p - e - - .	S - r - - s - u - - .
- a - - s - u - - .	A - - a - - i - C - a - t - - p r e - - .

When competitors have discovered all the correct names, or as many of them as they can find, they must make a list of them in the order in which they appear in the panel. Alongside each name must be written the initials of the owning railway company and in the case of the locomotives their wheel arrangements must be stated. If a station belongs to two railway companies, both companies must be named.

Prizes consisting of Hornby Train material (or Meccano products if preferred) to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded. For each mistake made by the competitor one mark will be deducted from the total number awarded so that the prize will be awarded to those boys whose solutions contain the least number of mistakes. In the case of a tie for any prize preference will be given to the competitor whose attempt is presented in the neatest and most novel manner.

Envelopes containing entries must be marked *"H.R.C. January Missing Links Contest"* in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st January. The entries from Overseas readers must reach this office not later than 30th April.

On the back of every entry submitted for this contest must be clearly indicated the sender's name and full address, and also his H.R.C. membership number. New readers who are not already members and who wish to compete should join the Hornby Railway Company. Application forms may be obtained from the above address.

Railway Photographic Contest

Last month we announced a winter series of Photographic Contests in which competitors were invited to submit photographs they took during the summer months or snaps of typical winter scenes. This month we announce the second contest of the series. There are no restrictions with regard to the subject chosen and competitors may send as many prints as they desire, but no competitor can win more than one prize.

The Contest will be divided as usual into two Sections, Home and Overseas, and prizes of Hornby Train material (or Meccano products if preferred) to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the sender of the four best entries submitted in each Section. In the case of a tie, for any prize, the prize money will be equally divided.

Envelopes containing entries must be marked *"H.R.C. January Photographic Contest"* in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13 on or before 31st January. The closing date for the Overseas Section is 30th April.

Voting Contest

The competitions put forward on this page last year were immensely popular and the response by H.R.C. members suggested that all subjects were favourites. In order to help us to decide what particular type of contest is most popular we are announcing this month a Voting Competition on this point.

Every entrant is required to state:

(1) Which of the 12 main H.R.C. Contests of 1934 was his favourite.

(2) What he considers are the eight most popular of these Contests in order of their popularity.

Prizes of Hornby Train goods (or Meccano products if preferred) to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the four competitors in each section, Home and Overseas, who forecast the final order of voting most accurately.

Envelopes containing entries should be marked *"H.R.C. January Voting Contest"* and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before the 31st January. Overseas closing date, 30th April.

COMPETITION RESULTS

September "Railway" Photographic Contest.—1. V. L. Breeze (2134), Kingston. 2. T. F. Fletcher (6057), Birmingham. 3. S. Garbutt (30122), Altrincham. 4. E. G. Veness (29595), London, N.W.6.

September "Drawing Contest."—1. R. C. Storrar (8625), Letham Ladybank. 2. J. Macken (23826), Bromley. 3. R. Smith (14750), Ossett. 4. H. Sutcliffe (20504), Preston.

October "Impossible Tour Contest."—1. J. C. Button (10335), Crewe. 2. E. Beven (35158), Sheffield. 3. E. B. Simpson (36342), Spondon. 4. R. Sutton (34561), Wolverhampton.

October "Railway Description Contest."—1. E. B. Simpson (36342), Spondon. 2. W. Lobb (11765), Rochdale. 3. F. Mahoney (12725), Rochdale. 4. M. Vincent (8610), Wolverhampton.

October "Articles Suggestion Contest."—1. B. Hardie (6792), Bristol 9. 2. C. E. Wrayford (6039), Moretonhampstead. 3. R. Barbary (5580), St. Ewe. 4. J. L. Makin (30933), Preston.

OVERSEAS

July "Locomotive Problems."—1. R. V. Turner (10033), Australia. 2. F. D. Aria (12362), Bombay. 3. G. E. Schulz (15425), Australia. 4. R. A. Wragg (7913), India.

July "Drawing Contest."—1. J. Rodriguez (3647), Canada. 2. M. Conly (24290), N. Zealand. 3. P. Galdes (14183) Malta. 4. S. D. Kurlawala (28724), Bombay.

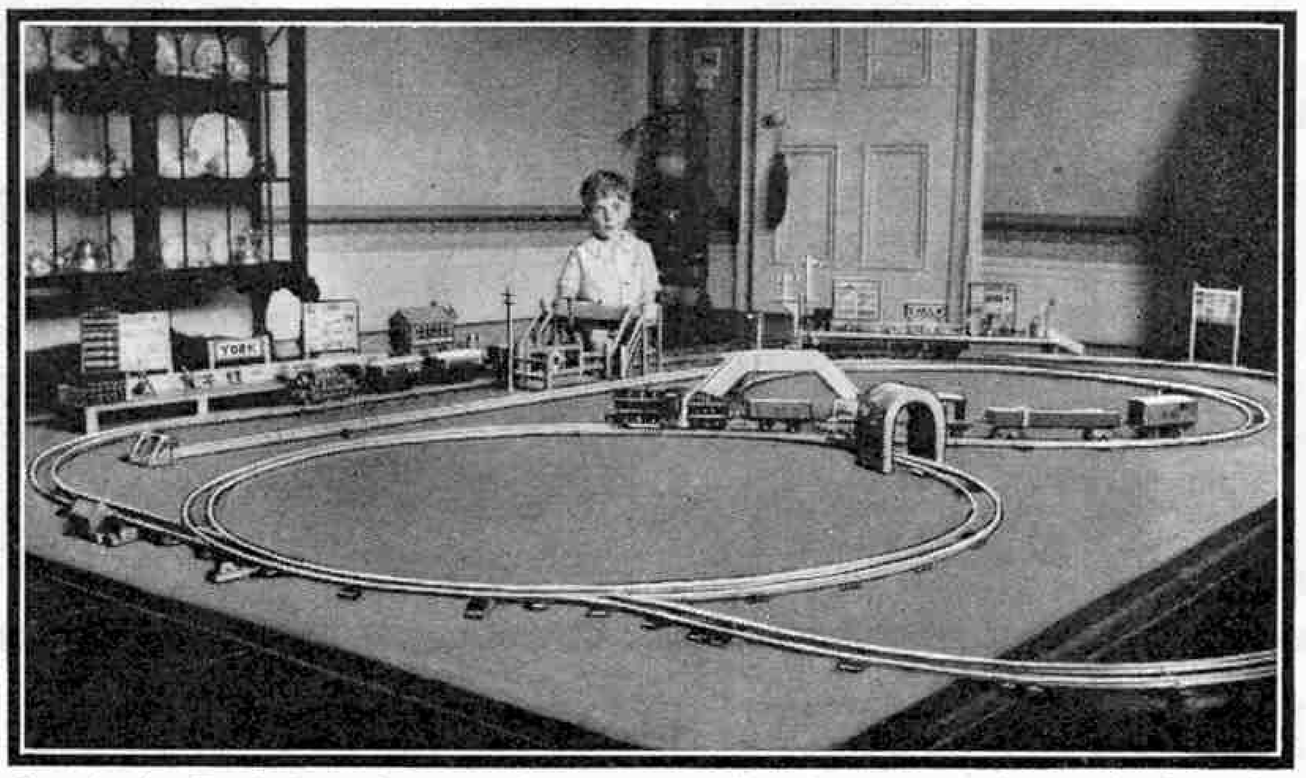
July "Photographic Contest."—1. K. F. Caldwell (17284), Australia. 2. C. R. Sanders (29648), Argentine Rep. 3. F. L. Bingen (28995), Holland.

Hornby Railway Layouts

The Possibilities of Simple Track Systems

AT the present time many boys will recently have become owners of Hornby Train Sets or will be considering starting the popular miniature railway hobby. If they are already readers of the "*M.M.*" they will be fairly well acquainted with the possibilities of realistic operation afforded by even the simplest Hornby layout. Those who are new readers, however, in addition to being beginners as Hornby train owners, are likely to have little idea of how a simple layout can be expanded gradually into a complete system. This article is specially intended for such boys.

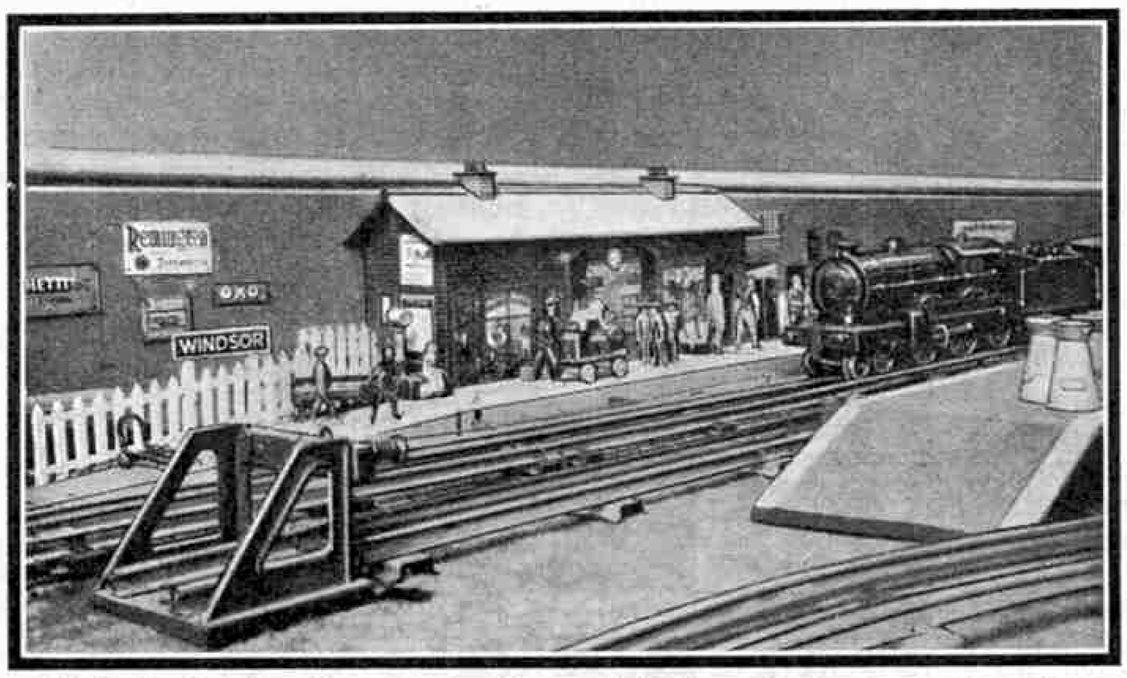
The rails contained in a Hornby Train Set are sufficient to make up a circle or a small oval. For a time, during the early stages of miniature railway ownership, a boy will be content with this and will find his main interest in carrying out the instructions with regard to lubrication, and watching his engine being run-in. Soon, however, he will begin to feel the need of a more extensive track in order to use his locomotive and train to better advantage. At this stage the usual step is to obtain more straight rails to expand the existing track to a large oval. This extension provides more fun because of the longer runs available and the greater opportunities of testing the capabilities of the locomotive. On the other hand, the track has no more operating interest than the original.



An extensive Hornby layout incorporating various loop lines, branches and sidings, with interesting possibilities for train operation.

The use of points makes it possible to divert the train from one track to another, and then addition to the equipment immediately increases the interest and possibilities of the miniature railway. Different arrangements combining circular and oval tracks can be developed in practically numberless variety, according to the space available and the rails that are to hand. Sidings become possible, and the system takes on a more realistic and railwaylike aspect and the train services can be developed accordingly.

In addition to points, crossings are other interesting track components, and they can be made use of to convert the plain circle or oval into a "figure-eight." Several crossings can be used together in the same track and, more interesting still, they can be used in conjunction with points to produce some very intricate formations.



Part of a Hornby railway developed on realistic lines, showing the main station.

In the meantime the usual process is for the rolling stock, and perhaps the locomotives also, to be increased in number, and with the addition of lineside features and accessories the railway gradually comes to resemble the real thing more and more closely. Separate tracks may become necessary for trains travelling in each direction on the line, so that Hornby Double Track is then made use of, although perhaps not throughout the layout. This Double Track is unique in that the rails of the up and down tracks are laid on long sleepers common to all four rails, so that there is no chance of the two tracks becoming out of alignment with one another. The curves are particularly useful. They too are arranged with common sleepers, and form the only method, with the tinplate type of rail, of securing parallel curves on a double track layout with each track the correct distance from the other. This distance between tracks agrees with the Crossover Points by means of which trains can be run from the up to the down road and vice versa; with Parallel Points by means of which a double track converges into single line; and of course with such important accessories as Level Crossings and Engine Sheds.

The main line of a layout may therefore be made up of double track, but any branch lines for light local traffic will be single track. Actual practice can thus be approached closely as regard running lines, and this applies also to the very necessary sidings and shunting yards. These can be laid out in a tremendous variety of ways according to the space available.

Layout possibilities for electric systems are as great as for clockwork tracks, as Hornby Electric Rails are made on the same principle, and the lengths, radius of curves, and other important dimensions have the same relation one to another, as with the ordinary Rails for clockwork trains.

A recently published booklet entitled "*Hornby Layouts—One Hundred Suggestions,*" contains a series of diagrams showing how different layouts can be developed from the simplest to the most elaborate formations. The actual rails and points required for each plan are listed, so that if additional material is to be purchased the model railway engineer can see exactly what he will require. A copy of this booklet is enclosed in all new Hornby Train Sets other than M clockwork and the EM electric sets. Owners of these latter sets are strongly advised to obtain a copy of this booklet from their Meccano dealer, price 3d., or direct from Meccano Ltd., for 4d. post free.

In connection with the planning of layouts the importance of the space available is not generally realised. There are three sizes of curves in the Hornby System, the largest being the Standard 2 ft. radius curves. A circle of these requires a minimum space of 4 ft. 6 in. square and, similarly, an oval including a half circle of such rails at each end requires a minimum width of 4 ft. 6 in. also. These curves should be adopted wherever possible as they allow all the locomotives and rolling stock in the Hornby Series to be run on them.

The next size of curves are of 1 ft. radius which require a minimum space of 2 ft. 6 in. square for the accommodation of a circle. They are useful in enabling a layout to be arranged in spaces where 2 ft. radius curves are impossible, but they restrict the stock to be used to the smaller four-wheeled types. A 9 in. radius circle requires a space of 2 ft. square but these curves are only suitable foi MO trains.

Readers who find any special difficulty in the planning of their layouts are invited to write to Meccano Ltd., stating the exact nature of their problem.

Competition Corner



WHICH WERE THE MOST POPULAR COVERS IN 1934?

Among voting contests none has retained so high a degree of favour among our readers as the annual Cover Voting Contest held to decide the order of popularity of the coloured covers of the previous year's issues.

In the above illustration the splendid covers that appeared on the various issues of the "*M.M.*" during 1934 are reproduced in a reduced form in their order of publication—January to June in the upper row, and July to December in the lower. The reproductions are intended for reference purposes only. They convey nothing of the brilliancy of the colour of the originals, but new readers will find them of great assistance in forming their judgment. Those readers who possess copies of the 1934 issues, or are able to obtain them, should make a careful study of the originals before completing their entries.

Referring to each cover by its month of issue, each competitor is asked to state on a postcard:

A. The 1934 cover he likes best of all.

B. His idea of the order of popularity of the covers as decided by the massed vote of all the competitors.

This list must cover the whole year, every month being included. The name of the month must be given, and its number in the volume. Competitors need not place their own favourite cover at the head of list B, unless they believe that it will prove to be the popular choice of the remaining competitors. They should place it in the position in which they anticipate it will be placed by the massed vote.

The entrant's name and address must be added to the card, which should be addressed "Cover Voting Competition, Meccano Magazine, Binns Road, Old Swan, Liverpool 13." No competitor may submit more than one entry.

Prizes of Meccano products, to be chosen by the winners, to the value of 21/–, 15/–, 10/6 and 5/– respectively, will be awarded to the four competitors whose lists most accurately forecast the final result. In addition there will be a number of consolation prizes for entries next in order of merit. In the event of a tie for any of the prizes, preference will be given to the entry displaying the neatest or most novel presentation. Closing date, 31st January. Overseas, 30th April.

January Drawing Contest

As announced in our October issue, we are offering prizes throughout the winter for the best drawing or painting of any subject submitted during each month. The entries may be of any size, to suit the competitor's preference.

The entries each month will be divided into the usual two sections, A for readers aged 16 and over, B for those under 16, and prizes of Meccano products to the value of 21/– and 10/6 will be awarded for the best entries in each section.

A separate set of prizes, to be awarded in similar conditions, will be reserved for competitors in the Overseas section.

Entries to the January competition must be addressed "January Drawing Contest, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 31st January. Overseas closing date, 30th April.

Unsuccessful entries will be returned if a stamped cover is sent for the purpose.



We give herewith the solution to the July Crossword Puzzle, the Overseas section of the competition having closed. It should be noted that suitable alternatives for the definitions 1 Down and 1 Across were accepted as correct in the judging.

COMPETITION RESULTS

HOME

November Crossword.—1. B. Hardie (Bristol); 2. J. M. Southam (Lowestoft); 3. H. Rutter (Blackhill); 4. A. Dixey (Gillingham). Consolation Prize: R. P. Walford (Newton Abbot).

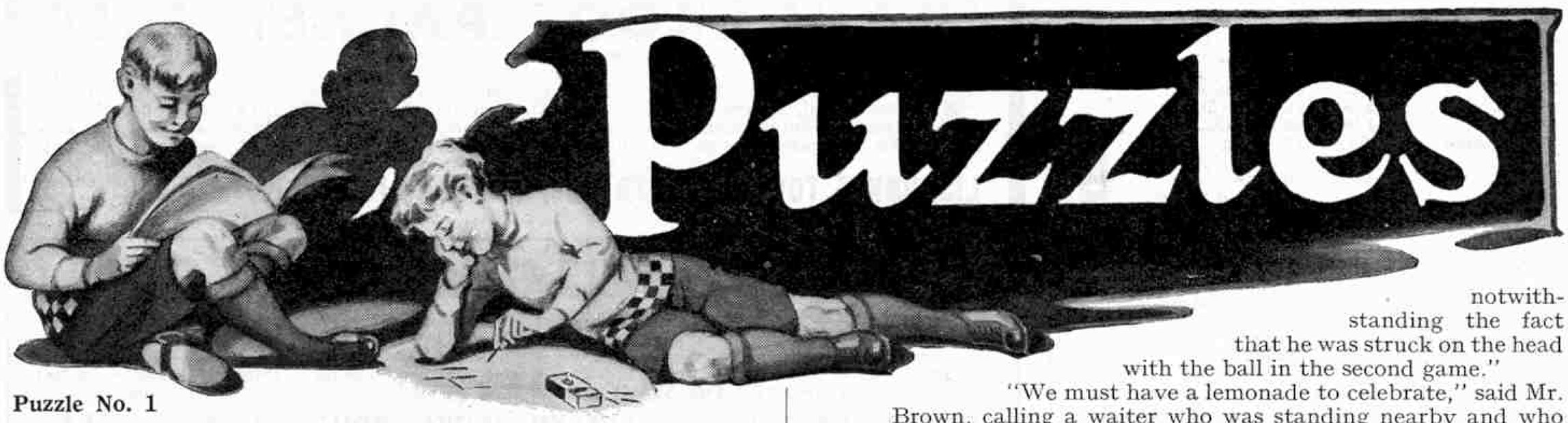
November Drawing Contest.—The high standard of the drawings submitted to the October competition was well maintained in November, and the judges exercised their discretion by awarding special prizes and a number of consolation prizes in each section.

We hope to reproduce some of the prizewinning entries in an early issue of the "*M.M.*" In the meantime readers will be interested to see the list of prizewinners, which is as follows:

First Prizes: Section A, G. D. Ingham (Wath-upon-Dearne); Section B, J. G. Bradley (Ferryhill Village); Second Prizes: Section A, R. C. Storrar (Letham Ladybank); Section B, R. Simms (Birmingham); Special Prizes: Section A, A. E. Lukey (Camden Town, N.W.1); Section B, J. Macken (Bromley). Consolation Prizes: V. Barnes (Sawston); R. E. Galbraith (Bromley); R. L. Green (Birmingham); P. A. Vicary (Cromer); H. Wright (Peterborough).

OVERSEAS

August Crossword.—1. H. A. Cripwell (Gatooma, S. Rhodesia); 2. J. Mallandaine (Edmonton, Alta.); 3. M. Buist (Feilding, N.Z.); 4. H. Mackay (Morrinsville, N.Z.). Consolation Prize: E. F. Evans (Wellington, N.Z.).



Puzzle No. 1

Sixteen aeroplanes, the names of which are given below, are hidden in Fig. 1. In order to discover them it is necessary to start at a certain square and follow the king's move at chess, which is one square at a time in any direction. Every letter is used once.

These are the aeroplanes hidden in the square, but they do *not* come in the order given: Atalanta, Bulldog, Cadet, Comet, Courier, Dragon, Fury, Hart, Hawk, Heracles, Mew Gull, Monospar, Scipio, Scylla, Swift, Vildebeest.

R	H	A	L	L	F	L	L	U	G
E	E	H	A	Y	U	L	D	W	B
A	R	I	C	W	R	I	E	E	E
C	R	S	M	Y	K	M	V	S	E
L	U	S	O	N	A	L	O	I	T
A	E	O	O	N	T	T	A	C	P
R	P	S	C	T	A	E	S	G	I
D	O	N	A	W	S	T	M	L	O
R	G	H	C	I	F	E	L	O	D
A	A	R	T	A	D	T	B	U	C

Fig. 1

Puzzle No. 2

A printing apprentice was given six lines of poetry to set up in type, but when he came to do it he found that he had no vowels left in his "case." As he was new, he thought the best thing to do was to set up the consonants with the type that he had, and fill in the vowels afterwards.

The result of the apprentice's work is shown below. Can you fill in the missing vowels?

Thsplndrfllsncstlwlls
Ndsnwysmmtsldnstry:
Thlnglghtshkscrssthlks,
Ndthwldctrctlpsnglry.
Blwbglblwstthwldchsflyng,
Blwbglnswrchsdyngdyngdyng.

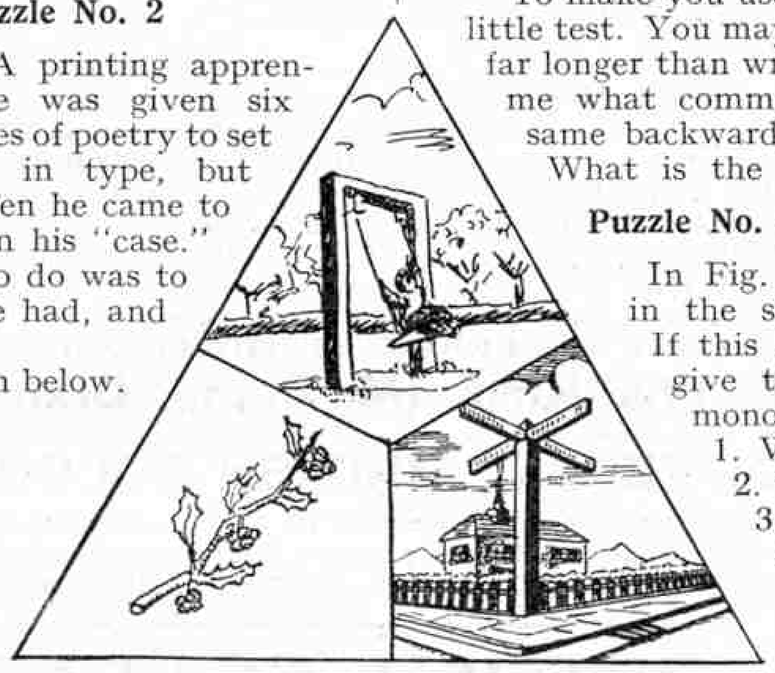


Fig. 2

Puzzle No. 3

In the triangle shown in Fig. 2, three things are represented. Write down the names of these and take two letters from each of them so that when re-arranged they will give the name of a well-known British motor car.

Puzzle No. 4

Each group of words below conceals the name of a well-known British town. What are the five towns?

1. LOONTB
2. RHWEETNSIC
3. ACEELNSTW
4. WEBYSRRHUS
5. SARACLENT

Puzzle No. 5

In the sentences below, a well-known line of poetry is hidden. The words are given in their correct order and the letters of each word are consecutive, although they may be split up among several words. For instance, the beginning of the quotation is "They," taken from the first three words of the first sentence.

"Hit!" he yelled delightedly as the ball whizzed through the air quite out of reach of the champion. He wondered was Hal sore still from the ball that had hit him on the head. It didn't seem so as he returned all that the server sent down.

"Now how are they getting on?" he heard his father ask.

"Hal's nearly won!" lyrically he chanted. "It has been a ripping game right from the first. And now that they are properly warmed up, it is simply marvellous tennis. Hal has never made a mistake, notwithstanding the fact that he was struck on the head with the ball in the second game."

"We must have a lemonade to celebrate," said Mr. Brown, calling a waiter who was standing nearby and who came up deferentially to take their order.

Puzzle No. 6

Can you fill in the missing parts of the letters in Fig. 3? If you can, a well-known proverb will be revealed. The letters are in their correct order, but the words are not.

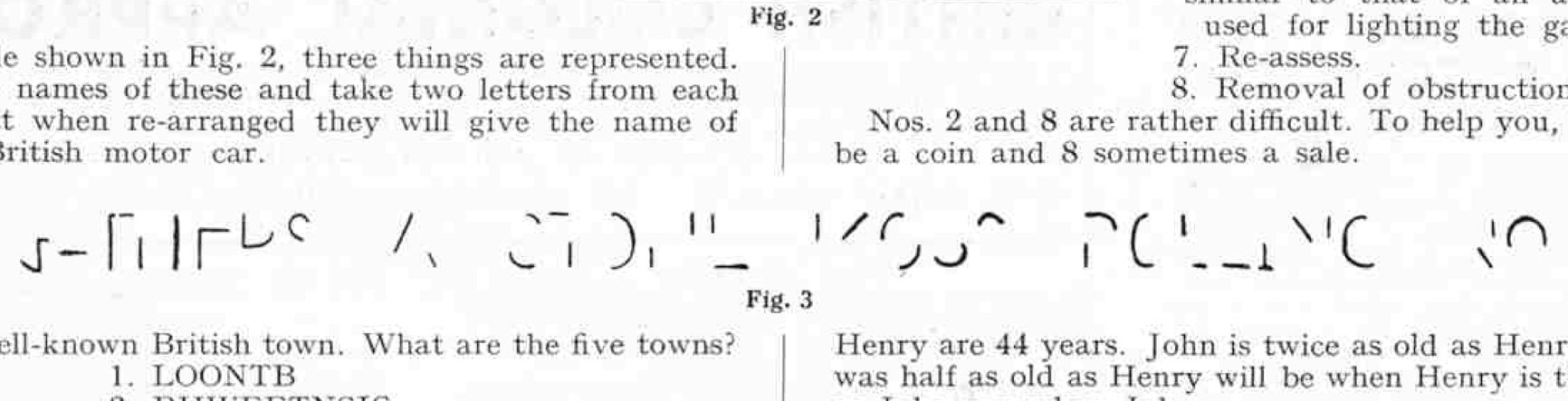


Fig. 3

Puzzle No. 7

Fill in the consonants in the following magic square:

E	–	–	O
–	–	I	–
–	I	–	E
O	–	E	–

Puzzle No. 8

Henry had not been doing his best at school and as a result was kept in when the others had gone home.

"To make you use your brain," his teacher said, "I'll give you a little test. You may get it done in two minutes or it may take you far longer than writing 200 lines. You can go as soon as you tell me what common word in the English language reads the same backwards, forwards and upside down!"

What is the word?

Puzzle No. 9

In Fig. 4, put vowels in the circles and consonants in the squares according to the clues given below: If this is done properly the centre vertical line will give the name of a well-known British low-wing monoplane.

1. What you must not do in school.
2. Very rarely seen.
3. Girl's name.
4. Ejaculation.
5. May be a man or an animal.
6. South American animal whose name is similar to that of an article sometimes used for lighting the gas.
7. Re-assess.
8. Removal of obstructions.

Nos. 2 and 8 are rather difficult. To help you, therefore, 2 may be a coin and 8 sometimes a sale.

Puzzle No. 10

The combined ages of John and Henry are 44 years. John is twice as old as Henry was when John was half as old as Henry will be when Henry is three times as old as John was when John was three times as old as Henry.

What are the respective ages of John and Henry?

Puzzle No. 11

Tommy's teacher one day asked him if he could arrange the numbers 1 to 7 so that when added up they would total 100.

Tommy tried for a long time, but without success. Can you do it?

(*Solutions next month*)

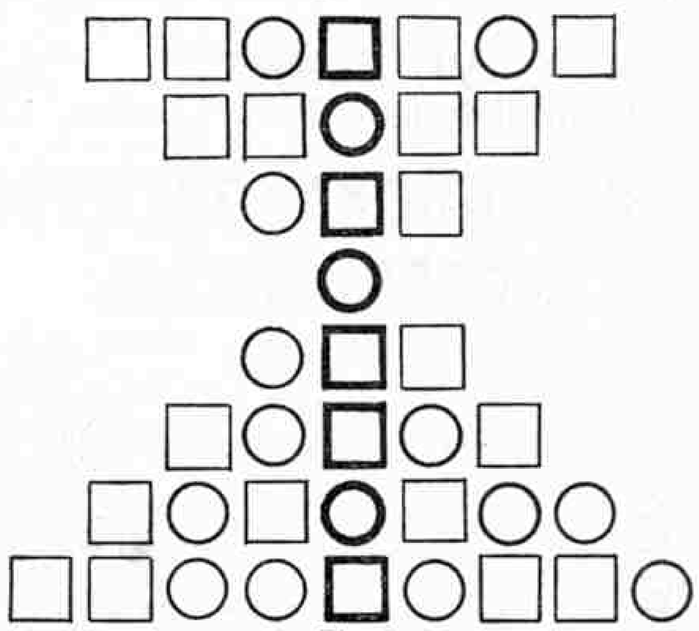


Fig. 4

SETS (POSTAGE EXTRA)

5	Abyssinia ...	3d.	20	India	4d.
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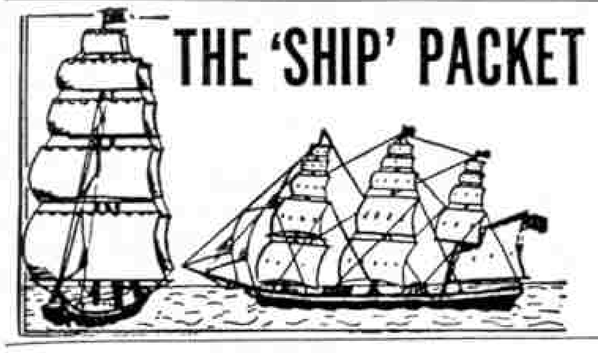
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Established 1869



A MARKED MAN

The all-in wrestler was at the police station making a complaint that a man had assaulted him.

"Would you recognise the man who waylaid you if you saw him again?" asked the sergeant.

"Oh, yes," said the professional wrestler. "I've got his left ear and one of his fingers in my pocket."

* * * *

The small boy from town was visiting his uncle's farm for the first time and soon after arriving he saw a pitchfork in the stable.

"I say, uncle," he said, "is that what the horses eat their hay with?"

* * * *

He was an enthusiastic collector.

"Look at this beautiful jar," he said. "It cost me only thirty shillings."

"Really?" said his rather bored friend. "I suppose the price included the jam?"

* * * *

Old George of the antique shop was nothing if not a pessimist.

"Well, George," remarked a friend, "how's business?"

"Terrible!" was the reply. "If things are expensive people can't afford them, and if they aren't expensive they don't want them."

* * * *

"Mother, if someone broke the flower vase, what would you do?"

"I'd spank him and put him to bed."

"Well, roll up your sleeves. Father did it."

* * * *

The talkative young man was trying to impress his companion with his knowledge of the theatre.

"Have you ever tried listening to a play with your eyes shut?" he asked.

"Sir," remarked a long-suffering man in a close-by seat, "have you tried listening to one with your mouth shut?"

* * * *

A youth about to leave college went to see the Head. "I must thank you, sir," he said. "All that I know, I owe to you."

"Pray don't mention such trifles," protested the Head.

* * * *

They were talking about the weather, and Harry summed up the situation.

"It strikes me that the usual unusual weather has been more unusual than usual this year," he said.

* * * *

RASTUS IN TROUBLE



Rastus (struggling with pair of new boots): "Ah shall nebber be able to get dese boots on until ah've worn dem for a few days."

* * * *

"I think you are the cleverest man I know."

"Sorry I can't return the compliment."

"You could if you told as big a fib as I did."

ASKING A PLAIN QUESTION

Counsel: "Now, sir, did you, or did you not, on the date in question, or at any other time previously or subsequently, say or even intimate to the defendant or anyone else, whether friend or mere acquaintance, that the statement imputed to you, whether just or unjust, and denied by the plaintiff, was a matter of no moment? Answer me yes or no."

Witness: "Yes or no what?"

* * * *

A DEEP DEPRESSION!



Deaf and Dumb Beggar: "Do you think it's going to rain?"

Blind Beggar: "I don't know and I can't look up at the sky, here comes my best customer."

* * * *

Employer: "But, look here, these aren't testimonials."

Office Boy (applying for job): "No, sir, but I thought they would help. They're copies of the death certificates of my four grandparents."

* * * *

The bore was relating some of his alleged experiences.

"While resting once in the Indian jungle a tiger came so close to me that I could feel its breath on the back of my neck," he said. "What do you think I did?"

"Turned up your coat collar," suggested a listener.

* * * *

Maid: "I'm sorry, but she said I was to tell you that she is not at home."

Caller: "Oh, that's all right. Just tell her that I'm glad I didn't call."

* * * *

Farmer: "An' how's Lawyer Jones doin', Doctor?"

Doctor: "Poor fellow! He's lying at death's door."

Farmer: "That's grit for ye—at death's door, an' still lying."

* * * *

"How long have you worked in this office?"

"Since they threatened to sack me."

* * * *

"Bill got his nose broken in three places."

"Well, if he takes my advice he'll keep out of those places in the future."

* * * *

Doctor: "What is indigestion?"

Medical Student: "The result of trying to get a square meal into a round stomach."

* * * *

A young man was running after a bus, and shouted to the conductor: "How much to the cinema from here?"

"Twopence," answered the conductor.

The young man continued to run, and after covering a further half-mile, panted: "How much now?"

"Threepence," replied the conductor. "You're running the wrong way!"

SEE-SAW

Lady (to tramp): "Did you notice that pile of wood in the yard?"

"Yes'm, I seen it."

"You should mind your grammar. You mean you saw it."

"No'm. You saw me see it, but you ain't seen me saw it."

* * * *

Father had taken his small son to church. He sat and listened very attentively without saying a word until the clergyman announced: "We shall now sing hymn two hundred and twenty-two, 'Ten thousand times ten thousand.' "

The puzzled boy nudged his father. "Dad, we don't have to work this out, do we?"

* * * *

"Don't come down that ladder, Mike, I've taken it away."

"Well, put it back quickly then; I'm half-way down."

* * * *

Old Lady: "The watch I told you about wasn't stolen after all; I found it at home."

Sergeant: "Sorry, madam, but we've found the thief."

* * * *

The page-boy had just carried the gentleman's luggage to the bedroom.

"Now, my boy," said the man, "what is your name?"

"Willie Brown," replied the boy, "but they call me Billiard Cue, 'cos I work much better with a tip."

* * * *

Fireman (to men in burning house): "Jump into the blanket."

Man: "No, you might drop it; put it on the ground first."

* * * *

Lady: "A strong man like you ought not to beg. Why don't you look round for a job?"

Tramp: "I can't look round, lady—I've got a stiff neck."

* * * *

"What does 'not transferable' mean on this ticket?"

"Sure, it means that you won't be admitted if you don't go yourself."

* * * *

"Now, I want a really high-bred dog," said the fussy customer.

"Yes, sir," said the dog fancier obligingly. "What about a Skye terrier?"

* * * *

TELLING THE TAIL



First Boy (at dog show): "Which end is its head?"

Second Boy: "I don't know. Let's stick a pin in and see which end barks."

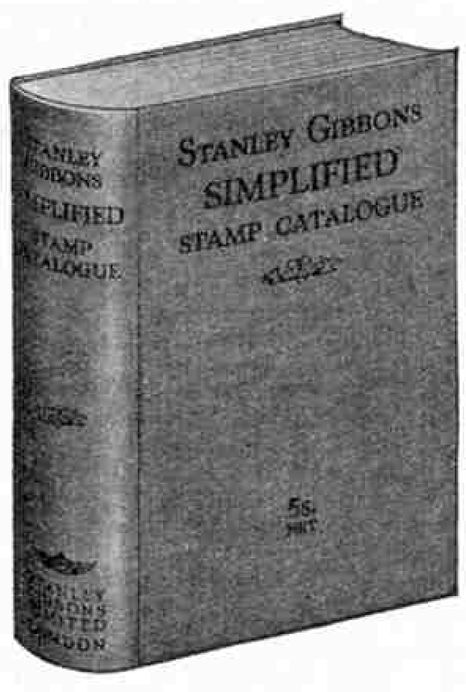
* * * *

Maid: "Your laboratory has blown up, sir."

Professor: "Good! That means my experiment has succeeded."

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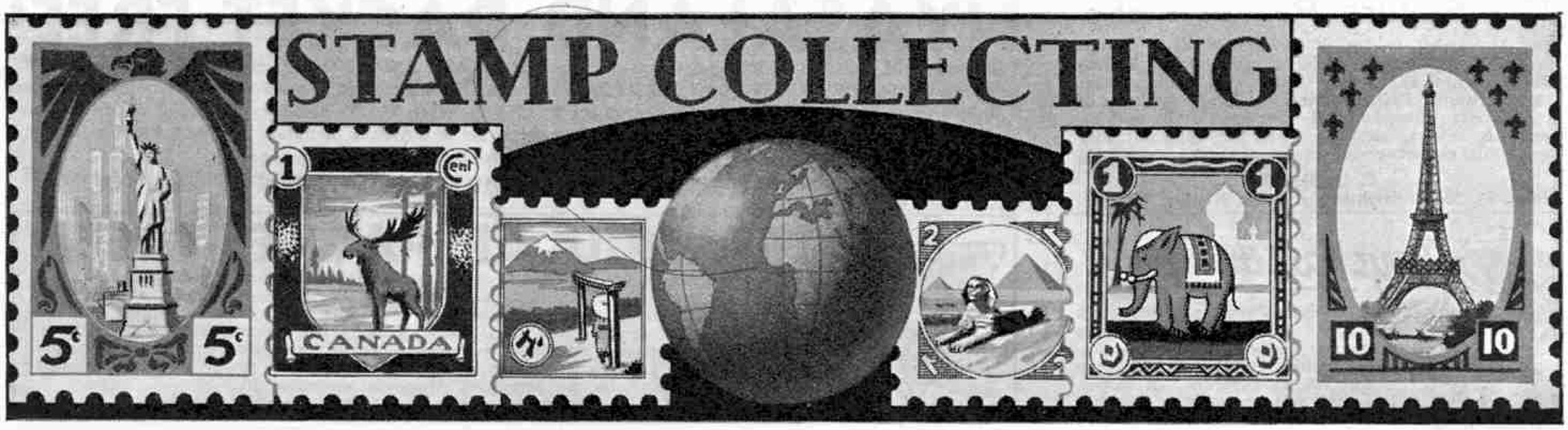
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REMODELLING THE COLLECTION

A reader wrote recently to tell us that he had received a present of a splendid new stamp album, and desired our advice to guide him in removing his collection from an old album and re-arranging it in the new one. At this moment probably hundreds of other readers are similarly rejoicing in the possession of a new album, and no doubt each one of them has resolved that the re-arrangement of the stamps shall be worthy of their new home. It will be useful, therefore, to devote this month's article to a discussion of the problems that arise when the re-housing of a collection is in hand.

In our article last month we referred to the creation of an art gallery in the album as an ideal to be striven for, with the object of making the collection a thing of interest to non-collecting friends. While the collector finds delight in browsing through his collection, lingering here and there as particular stamps and their individual history appeal to him, the interest and admiration of his friends is his next greatest pleasure, and that is not readily achieved.

The collection must radiate attraction, and it is essential to decide in advance just what stamps are to be included and where they are to go, so that they may be displayed to the best advantage. A definite standard of "presentability" must be set, and all stamps that do not reach that standard must be left out. Torn or heavily postmarked stamps and dirty or creased specimens must be excluded. Many collectors carry the discrimination against marked copies to the point of segregating used and unused stamps. Admittedly that course does ensure a standard of perfection, but few young collectors have either sufficient stamps to justify the separation, or sufficient pocket money to spare to enable them to buy mint stamps only. There is a way out, however, and that is to concentrate on used stamps, lightly postmarked.

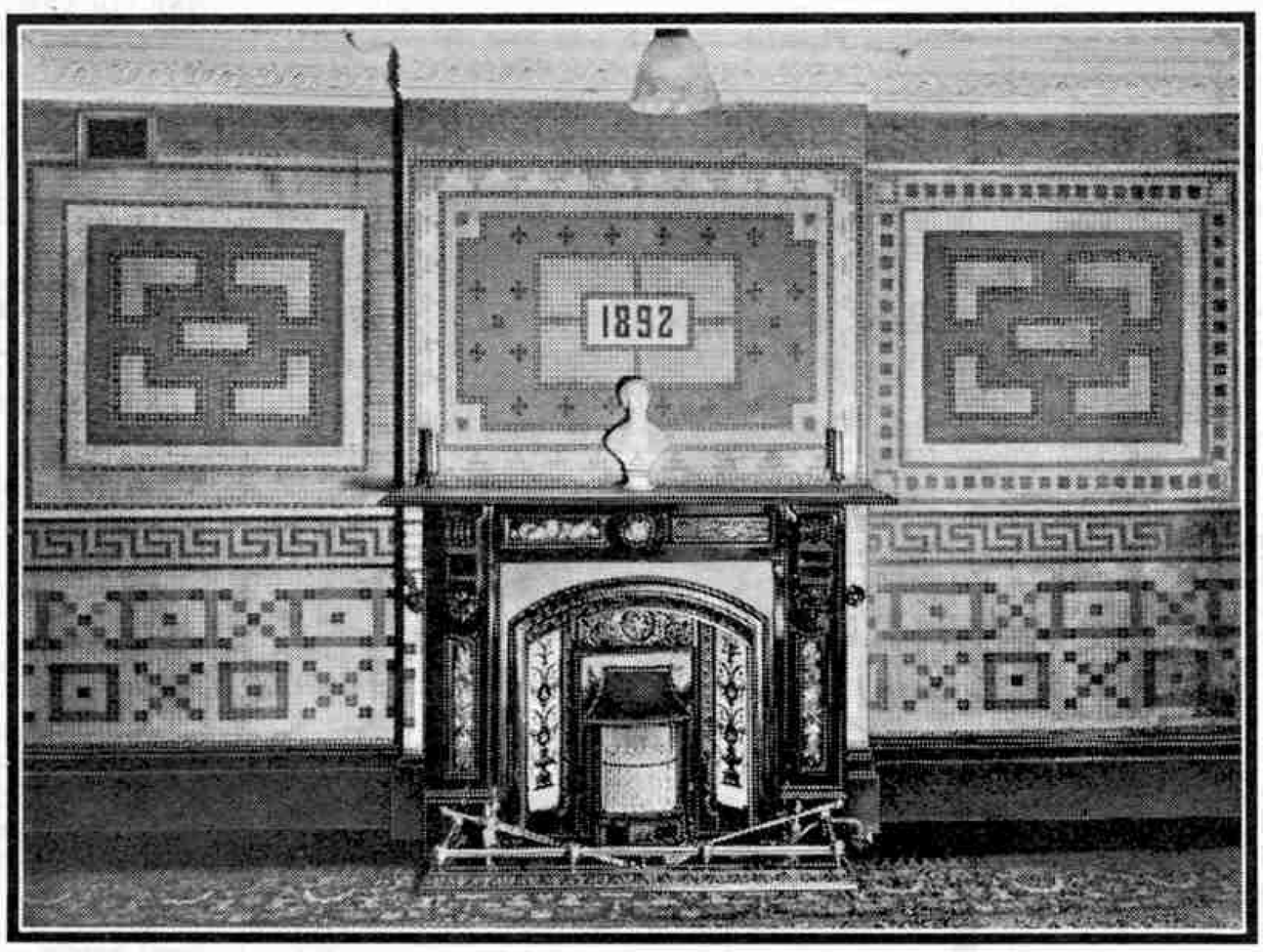
The next stage of the reconstruction is the actual mounting of the stamps. Here the collector can let himself go and, ignoring what has been done by others, express his own ideas. The one general principle to be observed is that the stamps must have plenty of room.

The walls of an art gallery are never crowded, for the pictures are hung only after due consideration of their size and shape. The stamp collector's job in arranging his treasures is rather easier than that of the curator of an art gallery. The stamps of any one issue usually are the same size, and they can be moved about the album page freely until the best arrangement is observed. If there is more than one size, usually there are several stamps in each, and the matter of securing a balanced arrangement is simplified. It is a good rule to balance the arrangement on the centre point of the page, a quite simple matter since the leaves of most loose-leaf albums are marked with faintly ruled squares, known as the quadrille, that enable one to measure up space readily.

Monotony of arrangement must be avoided. Obviously, when approximately equal numbers of stamps are being put on a series of pages, the repetition of particular layouts is difficult to avoid; but identical layouts should be kept away from one another as far as possible, so that the eye alights on something different as each page of the album is turned over. No two successive rows on a page should contain the same number of stamps, and it is a good rule to make alternate rows odd and even in the number of stamps they carry.

To a very considerable extent the amount of "writing up," that is, descriptive matter to be inserted alongside the stamps, will determine the number of stamps to be mounted on each page, but between 15 and 20 will be sufficient, with the proviso that, except in exceedingly long sets, a set must be completed on the page on which it starts. In practice a big set containing 12 or more stamps should be given a page to itself, but two smaller sets can appear on one page.

Next to good display, there is nothing that adds so greatly to the interest of a stamp collection as good writing up. The extent to which this is done will naturally depend upon the collector's own interest in his stamps, and may range from bare notes such as the date of issue, watermark and perforation, up to a complete description of all the circumstances surrounding the issue, including details and historical data associated with the designs.



Our illustration is of one of the walls in the study of Mr. Charles Whitfield King, the Ipswich stamp dealer. All four walls of the study are papered with stamps. Full details of this novel piece of mural decoration are given in a Stamp Gossip note on page 65. The photograph is reproduced by courtesy of Messrs. Whitfield King & Company.

It is better to avoid writing up altogether than to do the job in a slovenly way, and therefore neatness must be a constant aim. Ordinary handwriting or drawn lettering may be employed, but ornate styles that are not easily readable should be avoided. A more elaborate style of lettering is permissible for titles, or alternatively printed headings may be used. When done neatly, the hand-lettered title looks better, however. Colour should be used very sparingly, and in fact it is best to confine its use to the titling of the page and of the individual sets.

It is sound practice to draft out the notes to be written in before they are committed to the album itself. In this way sequence of data is ensured, and due regard can be had to the amount of material in relation to the space to be occupied. It is very annoying to discover, half way through an interesting series of notes, that the space allotted is far too limited, or that certain essential points have been omitted.

The arrangement and writing up of the stamp collection is necessarily a topic on which we can only generalise. Individual problems are bound to crop up, and if any reader encounters a difficulty that he cannot solve for himself, he should write to the Editor of the "*M.M.*," who will be glad to give his advice.

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6 Grenada. 1934 Mint ½d.—3d. ...	... **1/2**

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Stamps. Halfpenny approvals. 500 sent. Collection 500 perfect Colonials 12/6.—Wyk, 15, Paradise St., Liverpool.

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Stamp Gossip

and Notes on New Issues



A Room Papered with Stamps

In our Stamp Article this month we have discussed at considerable length orthodox ways of arranging a stamp collection. For those who are interested in unorthodox arrangements, the illustration accompanying that article will hold more than usual interest. The photograph shows one of the walls of Mr. Charles Whitfield King's study at his home in Ipswich, completely papered with stamps arranged to suggest mosaic work.

The total number of stamps on the four walls of this room is 61,242, all of which are unused specimens, except sixteen Great Britain stamps, which can be seen in the four corners of the centre panel over the mantel-piece. The face value of the stamps is about £1,000, and there are 50 different varieties, made up as follows:

11,346	Argentine Republic ...	4	varieties
8,445	Samoa	8	,,
4,177	Bergedorf	7	,,
6,885	Lübeck	4	,,
276	Serbia	4	,,
1,973	Hanover	1	,,
1,007	Cuba	3	,,
17,650	Roman States... ...	7	,,
4,287	Philippine Islands ...	1	,,
1,345	Alsace and Lorraine ...	7	,,
3,835	Sardinia	3	,,
16	English (sixpenny) ...	1	,,
61,242	Stamps	50	,,

The size of the room is 15 ft. by 13 ft., and it is believed to be the only one in



the world papered in this manner. The work of placing these stamps on the walls was carried out by a skilled decorator, who was engaged exclusively on this task for three months, working 11 hours a day. The date on the wall shows the year when the work was carried out.

One hesitates to guess at the present catalogue value of the stamps used. The 6,885 Lübeck alone would be worth £1,500!

Italian Colonial Commemoratives

The second exhibition of Italian Colonial Art, held recently at Naples, was celebrated by full sets of special commemorative stamp issues by the Italian Colonies, Eritrea, Cirenaica, Italian Somaliland and Tripolitania. Apart from the several very striking designs, the stamps are, as our illustrations show, notable for their unusually large format. Each colony issued 12 stamps, six values ranging from 5c. to 1L.25 sharing a common design, for general mail, and six ranging from 25c. to 2L. with two designs, for use on air mail.



Swedish Parliamentary Commemoratives

The fifth centennial celebration of the foundation of Sweden's Parliament is to be celebrated this month, and a series of commemorative stamps will be placed on sale co-incident with the reassembly of the Parliament on 10th January.

Each of the stamps will bear a design illustrating the ancient building in which met the Assembly of the Four Estates, representing the Nobility, the Clergy, the Burghers and the Peasants—the forerunner of the present Parliament. The values and designs will be as follows: 5 öre, the Old Law Courts; 10 öre, the Exchange; 15 öre, the Great Church; 25 öre, the House of the Nobility; 35 öre, the Houses of Parliament; 60 öre, a Nobleman, a Clergyman, a Burgher and a Peasant, and, above the group, the Coat of Arms of Engelbrekt.

The Whitfield King Annual List

One of the most useful stamp price lists we know is the Whitfield King "List of Postage Stamps in Sets and Packets," the 66th annual edition of which has just appeared. The usefulness of the list may be gauged from the growth of its size. When it first appeared 65 years ago it consisted of a single sheet. To-day it is a booklet of 148 pages and contains thousands of offers of sets and packets of used and unused stamps from almost every country in the world, including air mails, and ranging in price from pence to pounds. A special feature is made of subject packets.

The boy who is just commencing stamp collecting would find this list a very useful addition to his stamp library, and Messrs. Whitfield King and Company, Ipswich, have very kindly consented to present a copy free to any reader who writes for one, provided the "*M.M.*" is mentioned in the request.

Gibbons' Simplified Catalogue 1935

When the first edition of the Stanley Gibbons' Simplified Catalogue was reviewed in the April "*M.M.*," we forecast for it considerable popularity, and in sending to us a copy of the second issue Messrs. Gibbons tell us that nine-tenths of the large first edition was sold within a month of publication!

As most of our readers know, the Gibbons' Simplified Catalogue is intended to appeal to the general collector who is concerned entirely with designs, and whose view of the stamp field ignores details such as watermarks, perforations, shades of colour, and errors. The policy of the compilation is, in fact, "The stamp's the thing." Nevertheless, the second edition runs into almost 1,000 pages, lists 52,300 stamps and gives 6,500 full-size illustrations. No less than 770 new stamps have had to be included.

Bound in an attractive blue clothboard cover, the catalogue makes an ideal birthday present for any young stamp collector. It can be obtained from any stamp dealer, price 5/–, or direct from Stanley Gibbons Ltd., 391, Strand, London, W.C.2, price 5/6 post paid.

* * * *

The French colony St. Pierre and Miquelon has marked the celebration of the Fourth Centenary of Jacques Cartier's discovery of Canada by overprinting certain of the stamps of the current pictorial series with the inscription "*Jacques Cartier, 1534-1934.*"



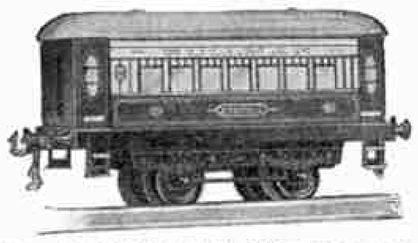
We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.



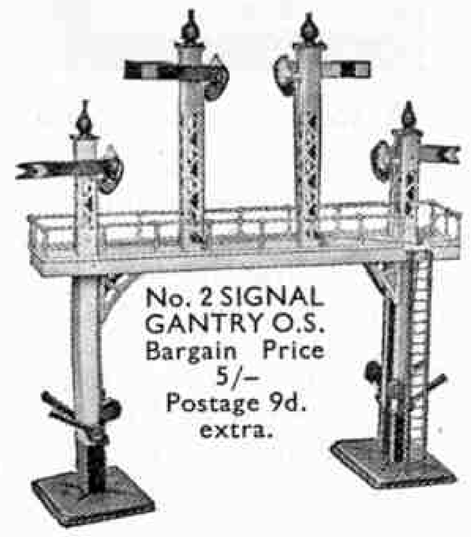
A page of New Year Bargains



The special bargains featured in this page are sure to appeal to all boys who are keen Meccano and Hornby Train enthusiasts. These goods are being offered at greatly reduced prices because they are not modelled on the latest patterns, and are not now listed in our catalogues. They are of the finest quality and will give every satisfaction.



No. 1 PULLMAN COACH O.S.
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Bargain Price 17/6. Carriage 2/– extra.



No. 3C RIVIERA "BLUE" TRAIN LOCOMOTIVE O.S.
Bargain Price 12/–. Postage 9d. extra.

Prices of New Year Bargains

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	Price	Postage extra
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No. 1a Aeroplane Outfit O.S. ...	4/3	9d.
No. 2 Aeroplane Outfit O.S. ...	8/3	1/–

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No. O Passenger Train Set O.S. ...	8/6	1/–
No. 1 Goods Train Set O.S. ...	11/3	1/–
No. 1 Passenger Train Set O.S. ...	12/9	1/–
No. 1 Tank Goods Train Set O.S. ...	11/3	1/–
No. 2 Goods Train Set O.S. ...	16/3	1/3
No. 2 Passenger Train Set O.S. ...	25/–	1/3
No. 2 Tank Goods Train Set O.S. ...	16/9	1/3
No. 2 Tank Passenger Train Set O.S.	20/–	1/3
No. 2 Special Goods Train Set O.S.	17/6	1/9
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No. 3E Riviera "Blue" Train Set (6-volt electric) O.S.	32/6	1/9
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No. 3C Riviera "Blue" Train Set O.S.	29/3	1/9

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No. O Locomotive, O.S.	5/3	6d.
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No. 2 Locomotive O.S.	10/–	9d.
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Brake Van, French type O.S. ...	2/–	4d.
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Refrigerator Van O.S.	1/6	4d.
Snow Plough O.S.	2/–	4d.
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No. 2 Wine Wagon O.S.	2/3	4d.
Bitumen Tank Wagon "Colas" O.S.	1/9	4d.
Trolley Wagon O.S.	2/–	6d.
Seccotine Van O.S.	1/6	4d.
No. 2 Luggage Van O.S.	2/3	6d.

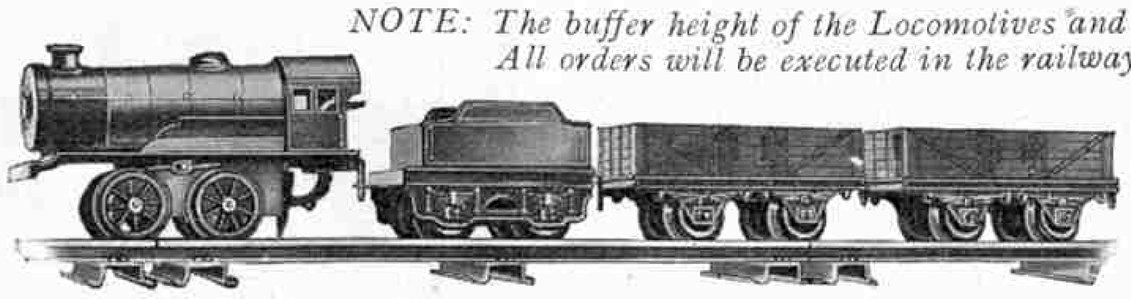
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Manufactured by MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

Floating Docks—(*Continued from page 5*)

disappeared when iron was introduced into shipbuilding. A patent for an iron dock was taken out as early as 1809, but little seems to have been done until the last decade of that century.

A patent was taken out in 1785 by a certain Christopher Watson for a wooden dock. Details of its design are scanty, but whether Watson used old hulks or built the docks specially, they were mere boxes provided with a gate at one end, into which the vessel was warped, after which the gate was closed and the water pumped out of the enclosed pound. They had no compartments, the displacement of the timber of which they were made giving them the necessary stability when sunk. They were in fact more like graving docks than modern floating docks, and in their old age, when they were thoroughly waterlogged, their flotation was so slight that their removal from the river to the mud on its bank was the natural result.

Floating docks have several advantages not possessed by the usual type of graving dock. They can not only be built quicker, but also with greater certainty; and they can be moved from place to place as required. Many docks are built in England and towed abroad. Not long ago one made a voyage from the Tyne to Wellington, New Zealand. It was a large dock of 17,000 tons' lifting power, and it met with no mishap on the voyage. The plates of this dock became so warm in the tropics that special clogs had to be provided for the crew! Self-propelled floating docks have been suggested, but so far this has not proved a practical proposition.

It is only necessary to find a sheltered site with sufficient depth of water, and there a floating dock can be parked. During times of war this is a useful asset. Not only can the dock lie concealed, but it can go out to the rescue of a crippled ship, which perhaps might have the greatest difficulty in getting to shore, or might never reach it at all, without being patched up. Docking has even been attempted successfully in mid-ocean—a risky proceeding, but one justified in a national emergency. If a ship has been hit by enemy fire and has a dangerous list to one side, the dock can be brought under it, tilted to the same angle, and then, when everything has been made fast, the whole lot pumped on to a level keel again.

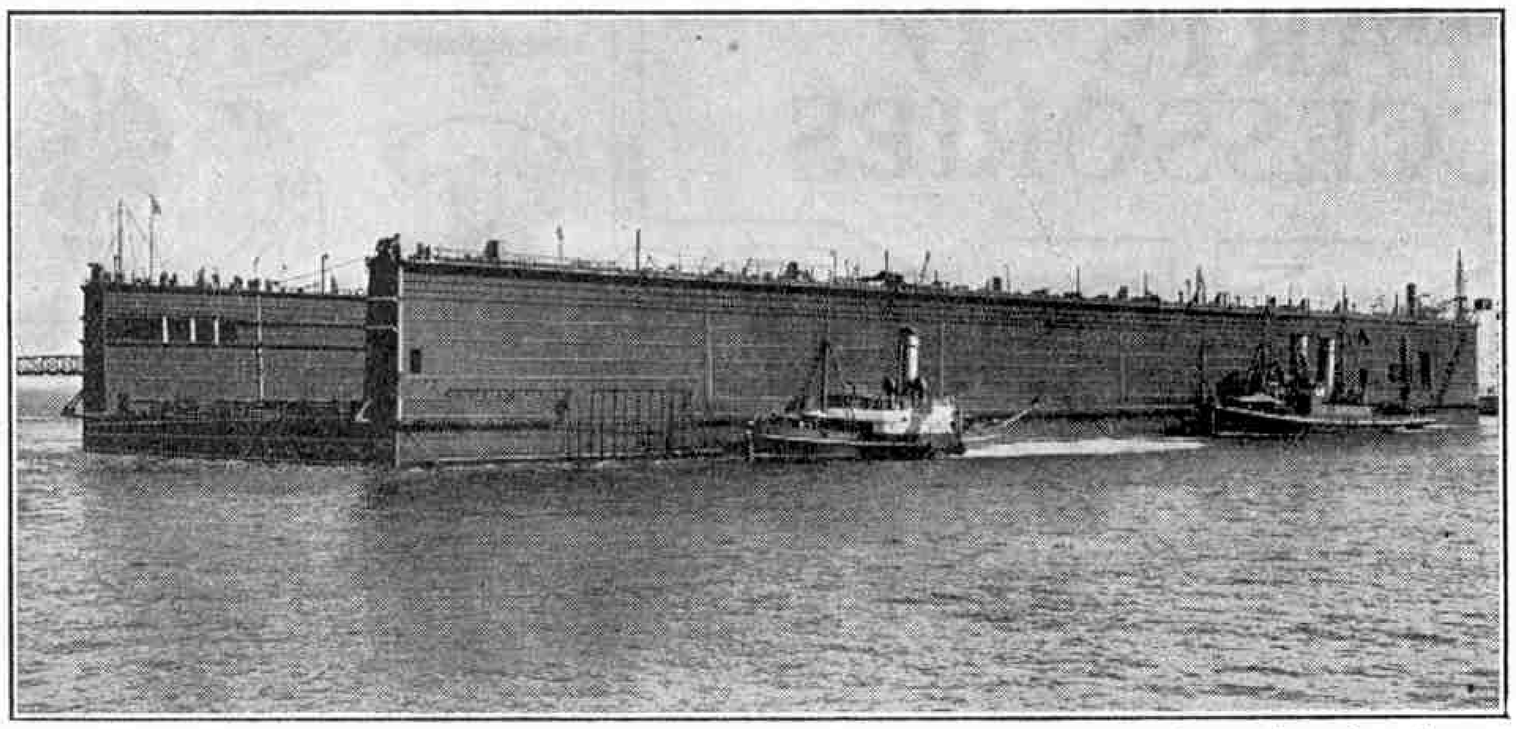
Floating docks can be entirely self-contained, which is a useful asset when, for example, they are required for use on a lonely whaling station hundreds of miles from a proper port. It has been found, however, that it is better to work such docks in connection with a shore establishment.

In fairness to the designers of graving docks it must be admitted that floating docks are not without their drawbacks. For example, in order to maintain a sufficient depth of water frequent dredging of the site is necessary in some cases. When Harbour Boards or shipowners are discussing whether to invest in a floating dock or the usual graving dock, they do not find it at all easy to make effective comparison of the merits of one over the other. After all the merits and demerits of each type have been summed up impartially, the decision must depend upon which would best suit the physical conditions of the site at which it is proposed to have the dock; and as conditions vary so greatly it is unjustifiable to say that one type of dock is better than the other.

Apart from considerations of the site, it is generally held that for ships needing long and heavy repairs the graving dock possesses greater advantages; but that the floating dock is often quicker and more convenient where the ship needs light repairs, hull inspection, and painting. Both types of work can be carried out on either type of dock with equal success.

Floating docks have been made in all sizes, with a lifting power ranging from about 100 tons up to 60,000 tons. The largest floating dock in the world is at Southampton. It has an overall length of 960 ft., an inside width of 130 ft. 8 in., and takes ships drawing 38 ft. of water. Its floor covers an area of 3¼ acres. The site is dredged to 61 ft. at low water of spring tides. The dock has 14 electrically-driven centrifugal pumps which, under normal conditions, will lift the largest ship afloat in about four hours. Mooring booms 110 ft. long secure the dock to four reinforced concrete dolphins on the shore. The booms are hinged at both ends to allow an up and down movement. The dock was constructed by Armstrong Whitworth and Co. Ltd., on the Tyne, and towed to Southampton. Its designers were Messrs. Clarke and Standfield, of Westminster, and it was "opened" by the Prince of Wales in April 1924.

Floating docks have been widely adopted on the Continent, especially in Germany and Holland, but in Great Britain there are at present more graving than floating docks. It is interesting to know that the two largest floating docks are British. After the great dock at Southampton, which is owned by the Southern Railway, the next largest is a dock of 50,000 tons' lifting power stationed at Singapore. It has an overall length of 850 ft. and a width of 172 ft., and the side walls, extending the length of the dock, are 50 ft. in height. Each wall is surmounted by a pair of four-ton travelling wharf cranes.



A floating dock at Malta used for docking the capital ships of the Mediterranean Fleet. This was formerly a German dock, and an extra section was built in this country and towed to Malta to be added to it.

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Plant Life in the Desert—(*Continued from p. 31*)

insects and small reptiles files out during the evening to see what the camp fire means. The open is preferable to the small villages, however, for their fauna is even larger.

The Yaqui is one of the largest rivers on the Pacific coast of Mexico, rivalling the old unharnessed Colorado in the strength of its floods and the size of its delta. The rich alluvial flats have in small part been brought under cultivation, and have become famous for the fine quality of the rice there grown. In order to reach southern Sonora it is necessary to cross the Yaqui. A single railway bridge is the only one that exists, and motorists are compelled to trust themselves to small ferry boats operated by poles and oars.

When we reached the river we found it running swiftly at a mid-flood stage and discovered that the stalwart ferryman was anxious to try out a new boat on which he could ferry two cars at once. We accepted the challenge, and in the quiet water of the lee shores safely crowded two cars on to the little boat, scarcely leaving standing room for the ferryman and his helpers. The handling of the boat while crossing the river was very skilfully done, and a good landing was made opposite a steep cut that had been dug in the 20-foot bank on the swift side of the river. The ferryboat, however, was not now securely tied up as it had been at the embarking place. The ferryman, with true Indian philosophy that every man should look out for himself, gave no warning that the removal of the weight of the first car might dump the second one into the river. As the first one crept across the planks towards the steep dusty incline, Dr. Mallery, too alert to be so easily trapped, simultaneously moved the second car forward to a central position on the boat. The reserve of the ferryman and his helpers was now gone, and they laughed approvingly.

We are indebted to the courtesy of the Carnegie Institution of Washington for the information in this article.

Meccano for Fancy Dress Costumes

Boys—and girls too—attired in costumes representing "Meccano," have been extraordinarily successful in winning prizes at Fancy Dress Carnivals in past years. We are always pleased to send suitable advertising material to boys and girls who wish to make Meccano costumes, and to hear of new ideas in this connection.

"The Schoolboy's Diary"

(Charles Letts's. 1/-)

The 1935 issue contains all the features that have made this diary so popular. There are useful notes concerning a variety of careers, lists of sports championships and of University and school sports records; and the diary pages carry interesting illustrated footnotes on topical subjects. In addition to the cloth edition at 1/-, the diary is published in leather cloth and leather at 1/6 and 3/- respectively, and these two editions contain a new feature in the form of an excellent series of maps of the world.

A Popular Modelling Medium

Few toys have enjoyed so widespread and so lengthy a popularity as Harbutt's Plasticine, and to-day this popular modelling material seems an even greater favourite than ever. The secret is that Messrs. Harbutt have never been content with their achievements, but have continually sought to widen the scope of the Plasticine enthusiast by improving their product.

This winter Plasticine will be available in a range of outfits priced from 1/- to 4/-, a price that will enable every boy and girl to enjoy the fun of creating their own models.

Harbutt's have introduced also a novel Plasticine shooting game known as "Dappadart." A dart tipped with Plasticine has to be blown from a tube at a target. There are great possibilities for fun with the game, which has, too, the merit of being perfectly safe.

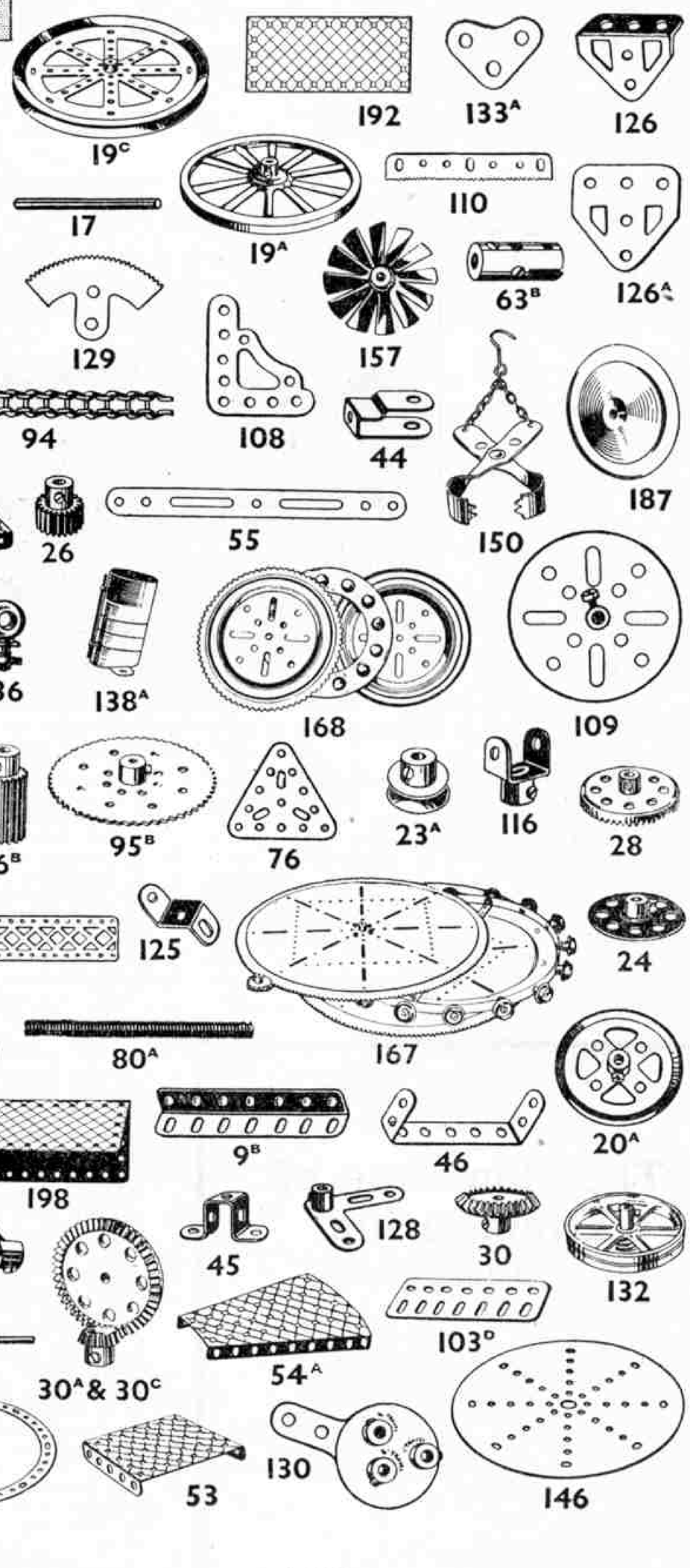
Dappadart is available in three styles, priced 6d., 1/- and 2/6 and full details may be had from any toy dealer or direct from Harbutt's Plasticine Ltd., Bathampton, Bath.

Tables for Home Billiards

Every year brings the same problem to parents of families—how best to ensure healthy diversion for the household during the long winter evenings. Thousands of families are finding the solution to this problem in the never-failing interest of home billiards which, played in the correct surroundings, is the most fascinating game for young and old. The firm of E. J. Riley Ltd., have for many years specialised in the production of high-class billiard tables suitable for use in small and medium sized houses. Riley "Home" billiard tables, which are made in five different sizes, have found wide popularity. They rest easily on an ordinary dining-table, and can be put out of the way when not required. One of the outstanding models in the Riley range is their "Combined" billiard and dining-table, which can be transformed in two minutes from a dining-table to a perfect billiard table.

An attractive art list of billiard tables will be sent to any reader who writes, mentioning the "*M.M.*," to E. J. Riley Ltd., Deal Works, Accrington.

MECCANO
PARTS & ACCESSORIES



KEEP ADDING TO YOUR OUTFIT

It is the ambition of every keen Meccano Boy to build bigger and better models. That is why he constantly increases the scope of his Outfit by adding more Meccano Parts and Accessories.

There are over 250 real engineering parts in the Meccano system, many of which are illustrated here. New parts are always being introduced in order to keep Meccano model-building in line with the most modern engineering requirements. The greatest care is taken in the designing of these parts to ensure that they function exactly as their counterparts in actual practice.

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

No.		s.	d.
3.	Perforated Strips, 3½" long ... ...½ doz.	0	4
9b.	Angle Girders, 3½" long „	0	8
20.	Flanged Wheels, 1⅛" diam. each	0	5
19s.	Crank Handles, small „	0	1
19a.	Wheels, 3" diam. ... ... „	0	6
	Pulley Wheels with centre boss and set screw:		
19b.	3" diam. ... ... each	0	6
19c.	6" „ ... ... „	1	9
20a.	2" „ ... ... „	0	4
21.	1½" „ ... ... „	0	4
22.	1" „ ... ... „	0	3
23a.	½" „ ... ... „	0	3
	Pulley Wheels without centre boss and set screw:		
22a.	1" diam. ... ... each	0	2
23.	½" „ ... ... „	0	2
24.	Bush Wheels ... ... „	0	4
26.	Pinion Wheels, ½" diam., ¼" face ... ... „	0	4
26b.	Pinion Wheels, ½" diam., ¾" face ... ... „	0	6
27a.	Gear Wheels, 57 teeth to gear with ½" pinion ... „	0	6
27b.	Gear Wheels, 133 teeth to gear with ½" pinion (3½" diam.) ... ... each	1	3
29.	Contrate Wheels, ½" diam. „	0	6
30.	Bevel Gear, ⅞", 26 teeth „	0	7
30a.	„ „ ½", 16 „ „	0	6
30c.	„ „ 1½", 48 „ „	1	6
31.	Gear Wheels, 1", 38 teeth „	0	10
34b.	Box Spanners ... ... „	0	4
44.	Cranked Bent Strips ... „	0	1
45.	Double „ „ ... „	0	1
46.	Double Angle Strips, 2½" × 1" ... ...½ doz.	0	6
52.	Perforated Flanged Plates, 5½" × 2½" ... each	0	5
55.	Perforated Strips, slotted, 5½" long ... ... doz.	1	6
63a.	Octagonal Couplings ... each	0	8
63b.	Strip Couplings ... ... „	0	7
65.	Centre Forks ... ... „	0	1
72.	Flat Plates, 2½" × 2½" ... „	0	2
76.	Triangular Plates, 2½" „	0	2
77.	„ „ 1" „	0	1
80a.	Screwed Rods, 3½" ... „	0	3
90a.	2½" Curved Strips, cranked, 1⅜" radius, 4 to circle „	0	1
94.	Sprocket Chain, per 40" length ... ... each	0	6
95b.	Sprocket Wheels, 56 teeth, 3" diam. ... „	0	6
96.	Sprocket Wheels, 18 teeth, 1" diam. ... „	0	3
99.	Braced Girders, 12½" long ... ...½ doz.	2	6
102.	Single Bent Strips ... each	0	1
103d.	Flat Girders, 3½" long ½ doz.	0	7
108.	Architraves ... ... doz.	1	6
109.	Face Plates, 2½" diam. each	0	4
110.	Rack Strips, 3½" ... „	0	2
116.	Fork Pieces, Large ... „	0	3
118.	Hub Discs, 5½" diam. „	1	3
119.	Channel Segments (8 to circle, 11½" diam.) „	0	4
120.	Buffers ... ... „	0	2
125.	Reversed Angle Brackets, ½" ... ...½ doz.	0	3
126.	Trunnions ... ... pair	0	3
126a.	Flat Trunnions ... each	0	1
128.	Boss Bell Cranks ... „	0	3
129.	Rack Segments, 3" diam. „	0	5
132.	Flywheels, 2¾" diam. „	2	0
133.	Corner Brackets, 1½" „	0	1
136.	Handrail Supports ... each	0	3
137.	Wheel Flanges ... „	0	3
†138a/z.	Ships Funnels (Raked) „	0	9
139.	Flanged Brackets (right) „	0	2
140.	Universal Couplings „	0	10
143.	Circular Girders, 5½" diam. „	1	0
144.	Dog Clutches ... ... „	0	6
145.	Circular Strips, 7½" diam. over all ... „	0	9
146.	Circular Plates, 6" diam. „	1	0
147.	Pawls with pivot bolt and nuts ... ... „	0	3
148.	Ratchet Wheels ... „	0	6
150.	Crane Grabs ... ... „	0	7
157.	Fans, 2" diam. ... ... „	0	4
160.	Channel Bearings, 1½" × 1" × ½" ... ... „	0	2
167.	Geared Roller Bearings „	20	0
168.	Ball Bearings, 4" diam. „	3	0
171.	Socket Couplings ... „	0	9
187.	Road Wheels ... ... „	0	6
192.	Flexible Plates, 5½" × 2½" ... ... doz.	0	9
197.	Strip Plates, 12½" × 2½" each	0	7
198.	Hinged Flat Plates, 4½" × 2½" ... ... „	0	8

† The series includes 26 Funnels in the correct designs and colours of leading Shipping companies.



This is the giant Fairey Long-range night bomber, a well-known type of low-wing monoplane used for long distance flying.

Buy a Meccano Aeroplane Outfit

and build realistic models of the World's leading aircraft

Every boy should know how aeroplanes are designed and constructed, and should be able to recognise at a glance the different types of machines in order to understand the purposes for which they have been developed.

The Meccano Aeroplane Constructor Outfits enable boys to design and build their own Aeroplanes quite easily, for these Outfits make possible aeroplane construction on sound engineering lines. All the parts are interchangeable on the famous Meccano principle.

The beautifully illustrated Manual of Instructions included in each Outfit shows how to build wonderful models of high and low-wing Monoplanes, Biplanes, Seaplanes and giant amphibian machines. In fact, models of almost every type of aircraft can be made with these splendid Outfits. Ask your dealer to show them to you.

PRICE LIST

STANDARD SERIES

No. O AEROPLANE OUTFIT

An interesting range of models can be built with this Outfit, including high and low wing monoplanes. Price **5/-**

No. O1P AEROPLANE HANGAR OUTFIT

This novel Outfit consists of the complete range of No. O Aeroplane Outfit parts packed in a No. O1 Aeroplane Hangar. Price **9/6**

Note.—The parts in the No. O and No. O1P Aeroplane Outfits are not intended for use with any of the other Outfits.

No. 1 AEROPLANE OUTFIT

Magnificent models of high and low wing monoplanes, and interesting model biplanes can be built with this fine Outfit. Price **9/-**

No. 2 AEROPLANE OUTFIT

This Outfit enables a splendid range of models to be built including triple-engined monoplanes and biplanes and a racing seaplane. Price **16/6**

SPECIAL SERIES

No. 1 SPECIAL AEROPLANE OUTFIT

The parts in this Super Aeroplane Outfit will build over 20 realistic models of different types of aircraft. Price **15/-**

No. 2 SPECIAL AEROPLANE OUTFIT

This is the finest Aeroplane Constructor Outfit on the market. It contains a big range of aircraft parts, with which numerous models of practically any type of machine may be built—44 examples are shown in the Manual of Instructions that is included. Price **25/-**

All Meccano Aeroplane Outfits are available in three different colour combinations—Red and Cream, Blue and White and Cream and Green.



This fine model of a low-wing monoplane is made with Meccano No. 2 Special Aeroplane Outfit.

Manufactured by

MECCANO LIMITED

Binns Road - Liverpool 13



No. O Meccano Aeroplane Outfit. Price **5/-**



No. 1 Meccano Aeroplane Outfit. Price **9/-**



No. 2 Special Meccano Aeroplane Outfit. Price **25/-**

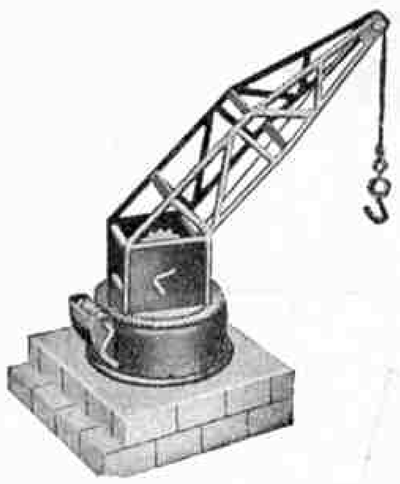
MECCANO AEROPLANE CONSTRUCTOR

HORNBY SERIES

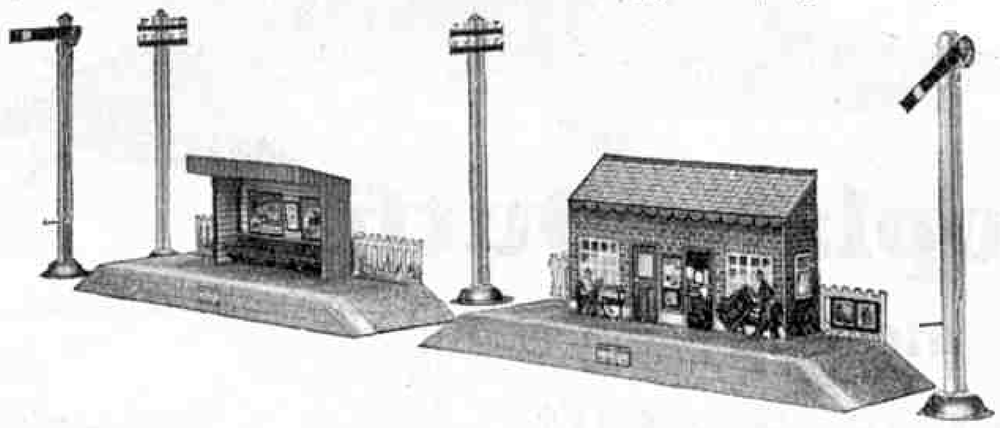
HORNBY ACCESSORIES

GAUGE O

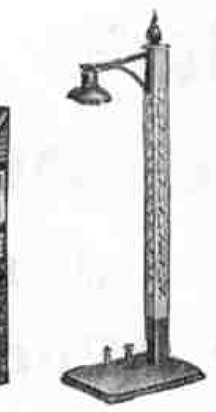
There is a splendid range of Railway Accessories in the Hornby Series, built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway may be constructed and operated in exactly the same manner as a real railway. A selection of Hornby Accessories is shown on this and the opposite page. Ask your dealer to show you the full range.

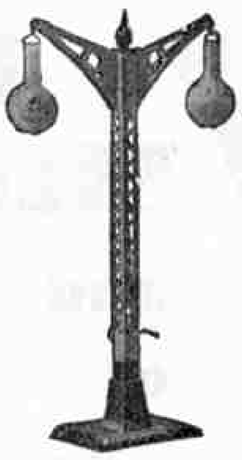


PLATFORM CRANE
Fitted with a crank handle and ratchet mechanism.
Price **3/11**



M STATION SET (7 pieces). Price **3**/– complete
The components of the M Station Set may be purchased separately.
M Signal Box. Price **4**d. M Signal. Price **4**d. M Station. Price **1**/–. M Telegraph Pole No. 1. Price **3**d. M Wayside Station. Price **9**d.





LAMP STANDARD No. 1E ELECTRICAL
(Single, as illustrated).
Price **3/6**

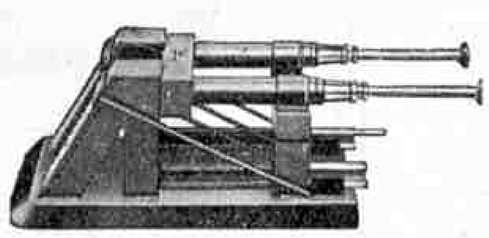
LAMP STANDARD No. 1
(Single).
Price **3/6**

LAMP STANDARD No. 2E ELECTRICAL
(Double).
Price **4/3**

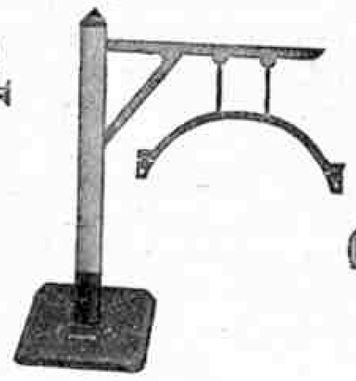
LAMP STANDARD No. 2
(Double, as illustrated).
Price **4/6**



STATION HOARDING
This is a realistic accessory, suitable for the station platform. Brightly coloured.
Price **6**d.



BUFFER STOPS No. 2
(Hydraulic type.) Price **5/6**

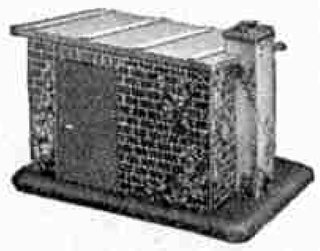


LOADING GAUGE
(Illustrated).
Price **2/3**
M LOADING GAUGE
Price **1/-**

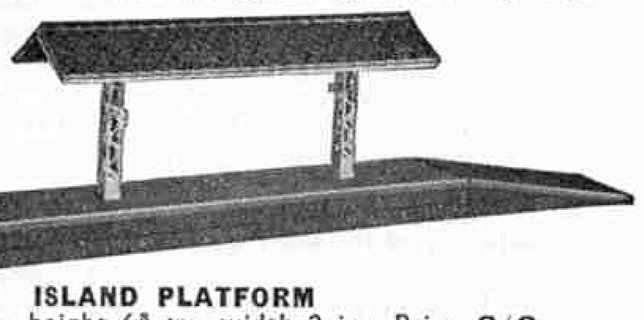


TUNNEL (Metal)
(As illustrated).
Price **3/11**

POSTERS IN MINIATURE
These Posters are beautifully printed in full colours.
No. 1 Series. Packet of 51 Price **6**d.
No. 2 Series. Packet of 51 ,, **6**d.



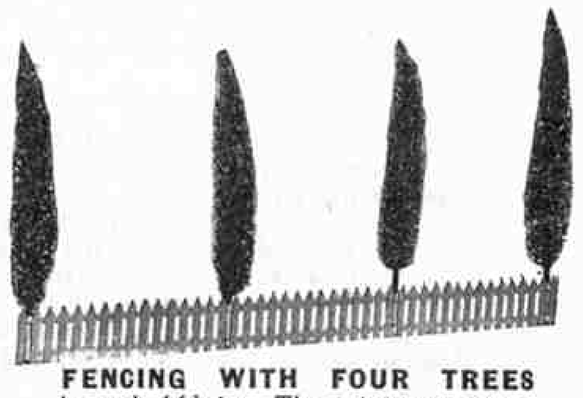
PLATELAYER'S HUT
Price **1/-**



ISLAND PLATFORM
Length 32¼ in., height 6¾ in., width 3 in. Price **6/6**
The ramps may be purchased separately. Price, per pair, **1/9**

RAILWAY ACCESSORIES No. 7
Watchman's Hut, Brazier, Shovel and Poker. Price **1/3**

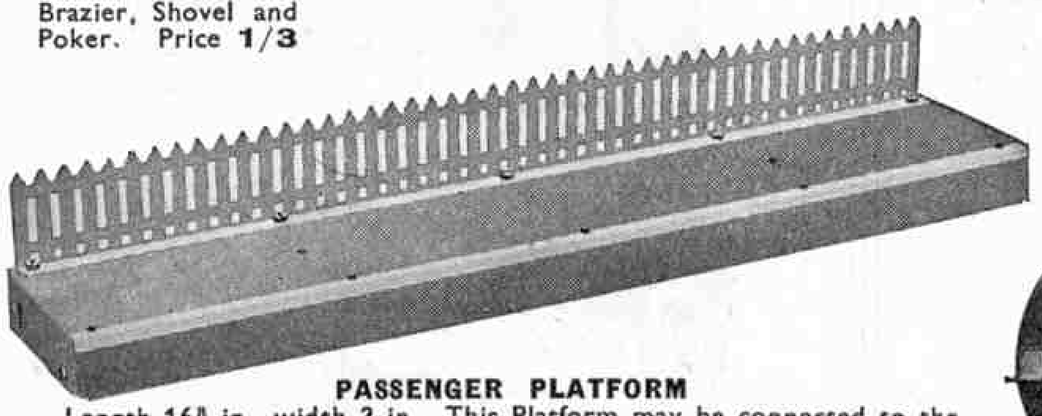
STATION No. 2
Excellent model, beautifully designed. Built up in three detachable sections.
Length 2 ft. 9 in., breadth 6 in., height 7 in. Price **9/6**



FENCING WITH FOUR TREES
Length 16½ in. The miniature trees are detachable. Price, per pair, **2/6**

TREES

Trees with Stands, assorted	per doz.	**3**/–
Trees, Oak ...	,,	**2/6**
Trees, Poplar ...	,,	**2**/–
Stands for Trees	,,	**1**/–
Hedging on Base (10½ in. lengths)	,,	**3**/–



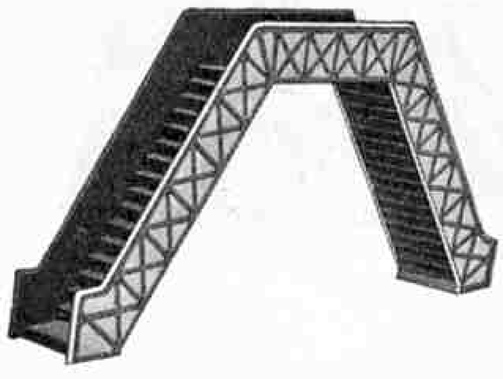
PASSENGER PLATFORM
Length 16¾ in., width 3 in. This Platform may be connected to the main Station or used separately ... ... Price **2/6**
The white Paled Fencing may be purchased separately. Price per length **6**d.



TURNTABLE No. 2
Price **3/9**

LUBRICATING OIL
Specially prepared for Hornby Trains, Rolling Stock and Accessories.
Price, per bottle, **6**d.

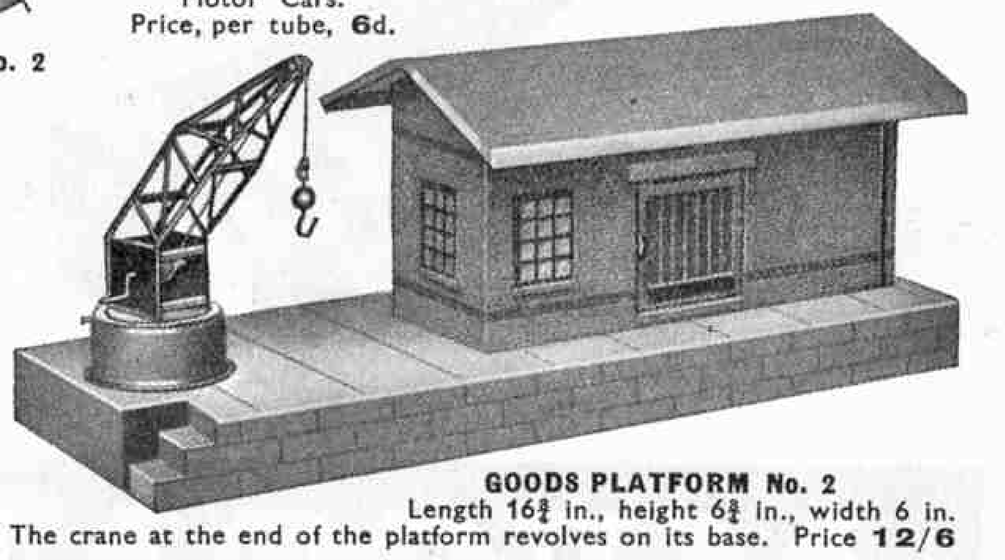
GRAPHITE GREASE
An ideal lubricant for the springs of Hornby Locomotives and Hornby Speed Boats, Meccano and Aero Clockwork Motors, and Meccano Motor Cars.
Price, per tube, **6**d.



M SERIES FOOTBRIDGE
This strongly-built Footbridge is made to span a single track. Price **1/3**



No. 1 GOODS PLATFORM
Length 13 in., height 6¾ in., width 6in. Price **7/6**



GOODS PLATFORM No. 2
Length 16¾ in., height 6¾ in., width 6 in.
The crane at the end of the platform revolves on its base. Price **12/6**

HORNBY SERIES

HORNBY ACCESSORIES

GAUGE O



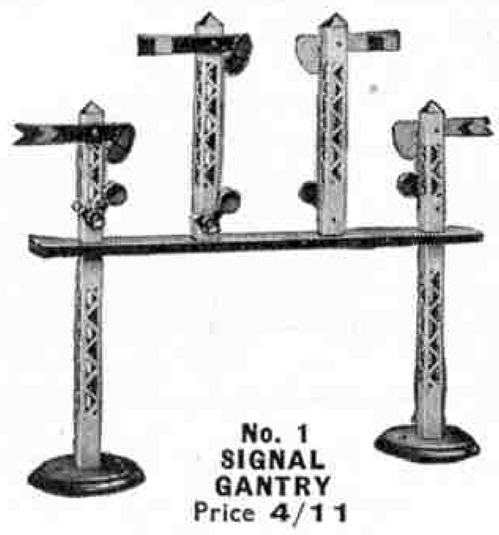
TUNNEL No. 0 (Straight)
Length 6 in., width 6⅛ in.
Price **1/3**

TUNNEL No. 1 (Straight)
Length 7 11/16 in. Width 6¼ in. (as illustrated). Price **1/9**

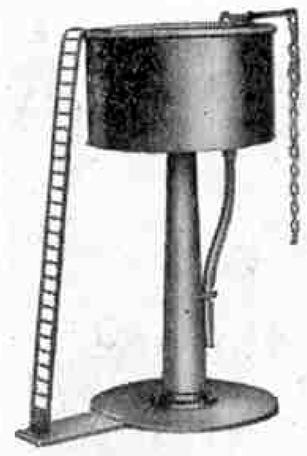
TUNNEL No. 2 (Straight)
Length 15⅝ in. Width 9½ in.
Price **3/6**



No. 1 WATER TANK
Fitted with flexible tube and valve lever. Stands 6½ in. high.
Price **3/–**



No. 1 SIGNAL GANTRY
Price **4/11**



No. 2 WATER TANK
Fitted with flexible tube and valve lever. Stands 8½ in. high.
Price **5/9**



Two No. 1 and one No. 2 Cuttings are illustrated here.

CUTTING No. 1 (END SECTION)
Base measurement: Length 7 11/16 in., width 6 in.
Price, per pair, **3/–**

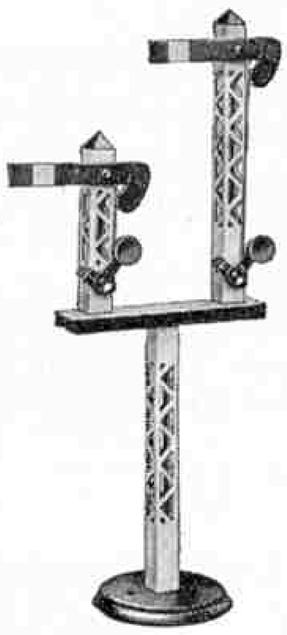
CUTTING No. 2 (CENTRE SECTION, STRAIGHT)
The addition of these centre sections enables a Hornby Railway cutting to be extended to any length. They are intended to be used in conjunction with the End Sections (Cutting No. 1), between which they are fitted.
Base measurement: Length 10½ in., width 6 in.
Price **2/–**

CUTTING No. 3 (CENTRE SECTION, CURVED)
This is used for curved tracks in the same manner as the straight centre section, described above, is used for straight tracks. It is suitable for both 1 ft. and 2 ft. radius tracks. Price **2/–**

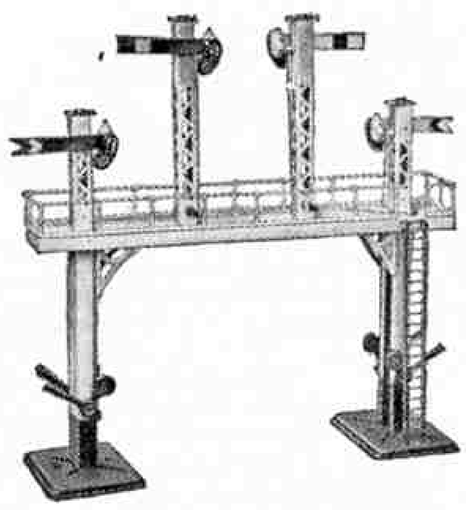


TUNNEL No. 5 (LEFT-HAND, CURVED)
(as illustrated)
This tunnel is in the form of a small hill, through which the track runs obliquely. For 2 ft. radius tracks.
Base measurement: 15⅞ in. × 14⅜ in.
Length of track, 17½ in. Price **6/9**

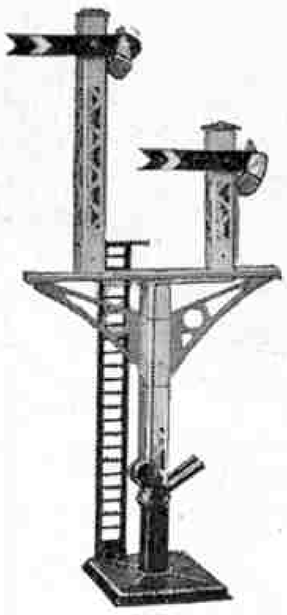
TUNNEL No. 6 (RIGHT-HAND, CURVED)
Similar to No. 5 Tunnel, but with track in the reverse position. For 2 ft. radius tracks only. Base measurement 15⅞ × 14⅜ in.
Length of track 17½ in. Price **6/9**



No. 1 JUNCTION SIGNAL
Price **2/9**



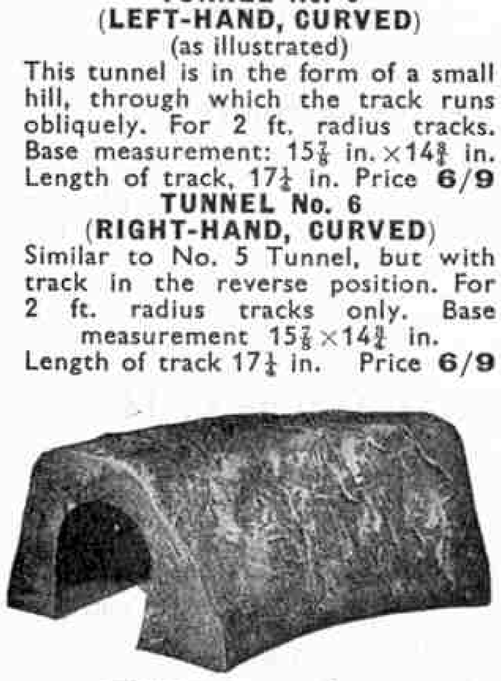
No. 2 SIGNAL GANTRY
Price **10/–**



No. 2 JUNCTION SIGNAL
Price **4/9**

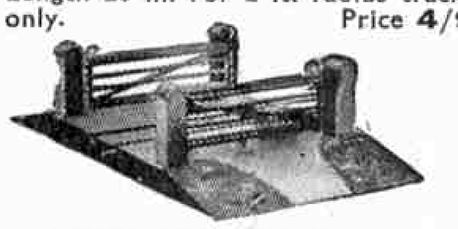


CUTTING No. 4 (STRAIGHT)
This is a double cutting, mounted on a base over which the railway track is laid.
Base measurement: Length 15⅝ in., width 15 in. Price **6/–**



TUNNEL No. 3 (Curved)
Length 13 in. Price **4/–**

TUNNEL No. 4 (Curved)
(as illustrated)
Length 20 in. For 2 ft. radius tracks only. Price **4/9**



LEVEL CROSSING No. 1
Suitable for a single track only and has Gauge O rails in position.
Price **2/11**



No. 1 SIGNAL CABIN
Price **2/9**

No. 2 SIGNAL CABIN
(illustrated)
Dimensions: Height 6½ in., width 3½ in., length 6½ in. Roof and back open to allow Lever Frame to be fitted inside cabin if desired.
Price **4/6**

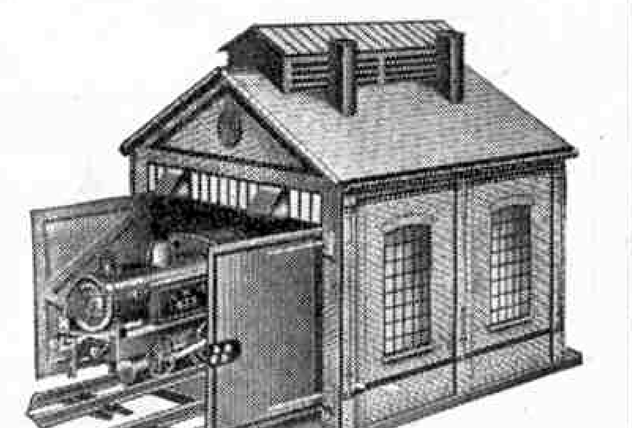


No. 1 FOOTBRIDGE WITHOUT SIGNALS
Price **2/11**

No. 1A FOOTBRIDGE, COMPLETE WITH SIGNALS. Price **4/6**



SHUNTER'S POLE
Price **2**d. each



No. 1 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 8¾ in. ... Price **15/–**

No. 2 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 17½ in. ... Price **22/6**

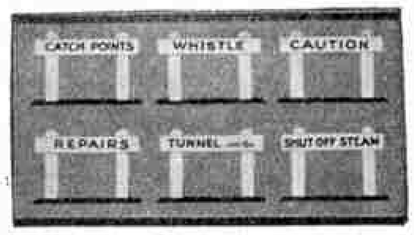


LEVEL CROSSING No. 2
Measures 13½ × 10½ in., with two tracks of gauge O rails in position. Price **5/6**

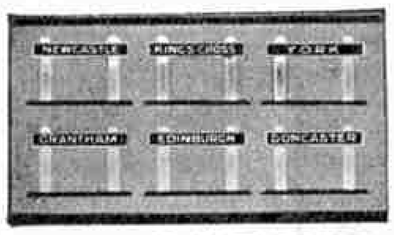
LEVEL CROSSING No. E2 (Electrical)
Similar to Level Crossing No. 2 excepting that a third rail is fitted in each of the two tracks. Price **7/6**



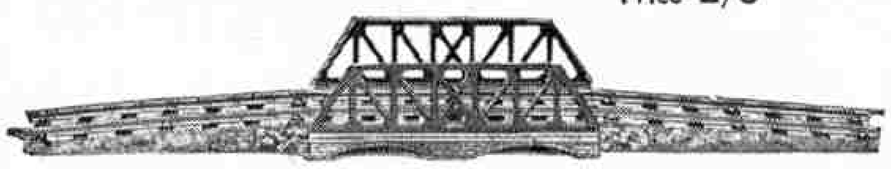
M TELEGRAPH POLE No. 2
Price 4d. each



RAILWAY ACCESSORIES No. 8
Notice Boards ... Price **2/3**



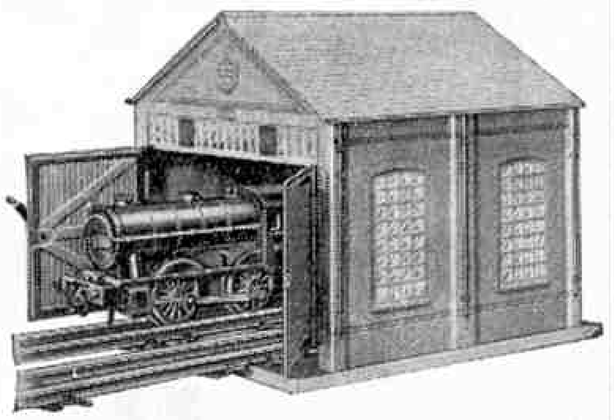
RAILWAY ACCESSORIES No. 9
Station Name Boards.
Price **2/6**



VIADUCT. Price **6/6** **VIADUCT ELECTRICAL.** Price **7/6**
VIADUCT. Centre Section only. Price **4/–**
VIADUCT (electrical). Centre Section only ... Price **4/6**



TELEGRAPH POLE
Price, per pair, **3/6.**

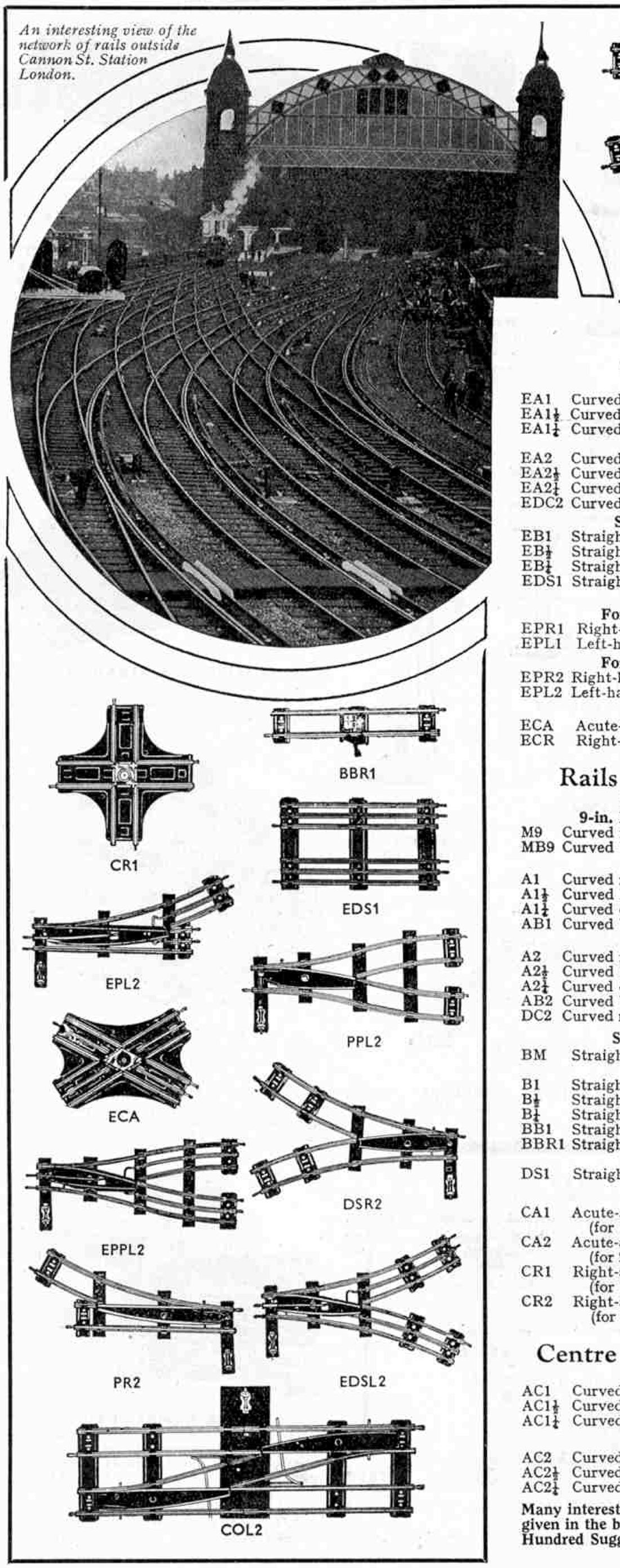


No. 1A ENGINE SHED
This Shed is of the same dimensions as the No. 1 Shed described above, but is of simpler design, and has doors at one end only ... ... Price **10/6**

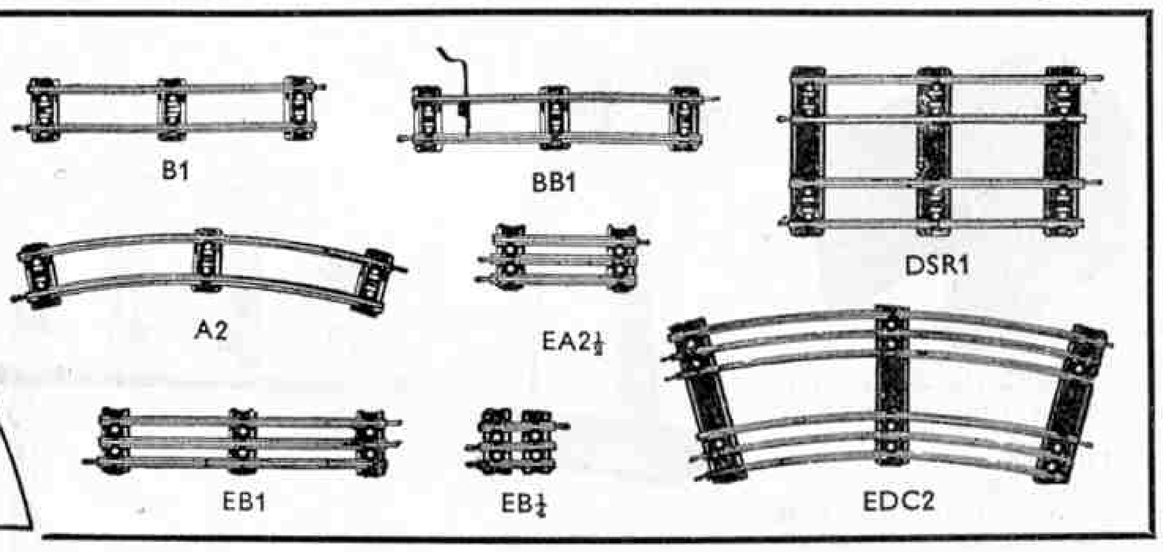
No. 2A ENGINE SHED
This Shed is of the same dimensions as the No. 2 Shed described above, but is of simpler design ... ... Price **17/6**

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

Hornby Rails, Points and Crossings



An interesting view of the network of rails outside Cannon St. Station London.



Rails for Electric Trains, Gauge 0, 1¼"

CURVED RAILS

1-ft. Radius

EA1	Curved Rails ...	... per doz.	5/–
EA1½	Curved half rails ...	„	4/6
EA1¼	Curved quarter rails ...	„	4/–

2-ft. Radius

EA2	Curved rails ...	... per doz.	5/–
EA2½	Curved half rails ...	„	4/6
EA2¼	Curved quarter rails ...	„	4/–
EDC2	Curved rails, double track, ½ doz.		9/–

STRAIGHT RAILS

EB1	Straight rails ...	... per doz.	5/–
EB½	Straight half rails ...	„	4/6
EB¼	Straight quarter rails ...	„	4/–
EDS1	Straight rails, double track, ½ doz.		8/6

POINTS

For 1-ft. Radius Curves

EPR1	Right-hand points	...per pair 5/9
EPL1	Left-hand points	

For 2-ft. Radius Curves

EPR2	Right-hand points	...per pair 6/6
EPL2	Left-hand points	

CROSSINGS

ECA	Acute-angle crossings ...	each	2/9
ECR	Right-angle crossings ...	„	2/9

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

EDSR1	Double symmetrical points, right-hand	...per pair 6/–
EDSL1	Double symmetrical points, left-hand	

For 2-ft. Radius Curves

EDSR2	Double symmetrical points, right-hand	... per pair 7/–
EDSL2	Double symmetrical points, left-hand	

PARALLEL POINTS

EPPR2	Parallel points, right-hand	per pair 7/–
EPPL2	Parallel points, left-hand	

CROSSOVER POINTS

ECOR2	Crossover points, right-hand	per pair 24/–
ECOL2	Crossover points, left-hand	

EMC20	Switch rail (20-volt) ...	each	1/3
EMC6	Switch rail (6-volt) ...	„	1/3
TCP6	Terminal Connecting Plates (6-volt)	„	1/3
TCP20	Terminal Connecting Plates (20-volt)	„	1/3

Rails for Clockwork and Steam Trains, Gauge 0, 1¼"

CURVED RAILS

9-in. Radius (for M0 Trains)

M9	Curved rails	per doz.	2/6
MB9	Curved brake rails, ...	each	3d.

1-ft. Radius

A1	Curved rails	per doz.	3/6
A1½	Curved half rails ...	„	3/–
A1¼	Curved quarter rails ...	„	2/6
AB1	Curved brake rails ...	each	4d.

2-ft. Radius

A2	Curved rails	per doz.	3/6
A2½	Curved half rails ...	„	3/–
A2¼	Curved quarter rails ...	„	2/6
AB2	Curved brake rails ...	each	5d.
DC2	Curved rails, double track, ½ doz.		6/–

STRAIGHT RAILS

BM	Straight rails (for M0 Trains),	per doz.	2/6
B1	Straight rails	„	3/6
B½	Straight half rails ...	„	3/–
B¼	Straight quarter rails ...	„	2/6
BB1	Straight brake rails ...	each	4d.
BBR1	Straight brake and reverse rails,	each	1/6
DS1	Straight rails, double track, ½ doz.		5/3

CROSSINGS

CA1	Acute-angle crossings (for 1-ft. radius tracks),	each	1/9
CA2	Acute-angle crossings (for 2-ft. radius tracks)	„	1/6
CR1	Right-angle crossings (for 1-ft. radius tracks)	„	1/9
CR2	Right-angle crossings (for 2-ft. radius tracks)	„	1/6

POINTS

9-in. Radius (for M0 Trains)

MR9	Right-hand points	... per pair 3/–
ML9	Left-hand points	

For 1-ft. Radius Curves

PR1	Right-hand points	... per pair 3/–
PL1	Left-hand points	

For 2-ft. Radius Curves

PR2	Right-hand points	... per pair 3/–
PL2	Left-hand points	
PSR2	Points on solid base, right-hand	per pair 8/6
PSL2	Points on solid base, left-hand	

PARALLEL POINTS

PPR2	Parallel points, right-hand	per pair 3/6
PPL2	Parallel points, left-hand	

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

DSR1	Double symmetrical points, right-hand	... per pair 3/6
DSL1	Double symmetrical points, left-hand	

For 2-ft. Radius Curves

DSR2	Double symmetrical points, right-hand	... per pair 3/6
DSL2	Double symmetrical points, left-hand	

CROSSOVER POINTS

COR2	Crossover points, right-hand	per pair 12/–
COL2	Crossover points, left-hand	
RCP	Rail Connecting Plates ... ½ doz.	2d.

Centre Rails for Converting Ordinary Track to Electrical

1-ft. Radius

AC1	Curved centre rails ...	per doz.	1/–
AC1½	Curved centre half rails	„	9d.
AC1¼	Curved centre quarter rails	„	6d.

2-ft. Radius

AC2	Curved centre rails ...	per doz.	1/–
AC2½	Curved centre half rails	„	9d.
AC2¼	Curved centre quarter rails	„	6d.

BC1	Straight centre rails ...	per doz.	1/–
BC½	Straight centre half rails	„	9d.
BC¼	Straight centre quarter rails	„	6d.
ICR	Insulators for insulating centre rails	per doz.	3d.
CCR	Clips for fixing centre rails	„	6d.

Many interesting illustrations and much useful information regarding Hornby Railway layouts are given in the booklets entitled "How to plan your Hornby Railway," and "Hornby Layouts—One Hundred Suggestions." Each of these booklets is obtainable from your dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d. post free.

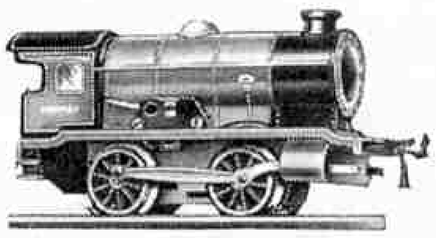
MANUFACTURED BY MECCANO LTD., BINNS ROAD, LIVERPOOL 13

HORNBY LOCOMOTIVES

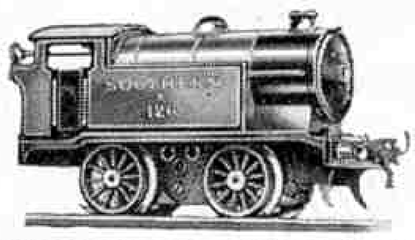
Boys! Increase the scope and efficiency of your model railway by adding to it one or two of the Locomotives illustrated and described below. These are the finest Locomotives of their respective types in the world.

Electric Models

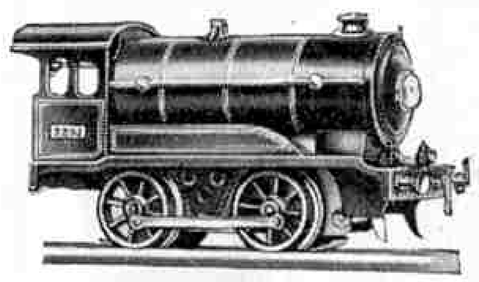
The Hornby Electric Locomotives have powerful smooth-running motors, with a low consumption of current. The new 20-volt Locomotives fitted with automatic reversing mechanism can be started, stopped, controlled for speed, and reversed entirely from the lineside. All Hornby Electric Trains are perfectly safe to operate.



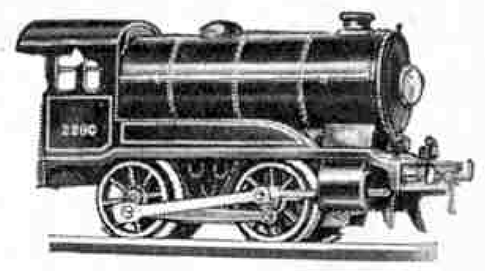
EM120 (20-volt) or EM16 (6-volt) LOCOMOTIVE
Non-Reversing. Available in either red or green. Price 8/6



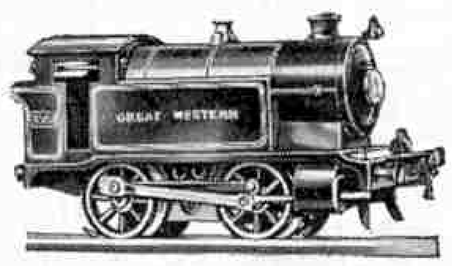
EM320 (20-volt) or EM36 (6-volt) TANK LOCOMOTIVE
Reversing. Available in red, with L.M.S.R. lettering, or green with L.N.E.R., G.W.R. or S.R. lettering ... ... Price 16/6



***HORNBY E020 (20-volt) or E06 (6-volt) LOCOMOTIVE**
Reversing ... ... Price 22/–



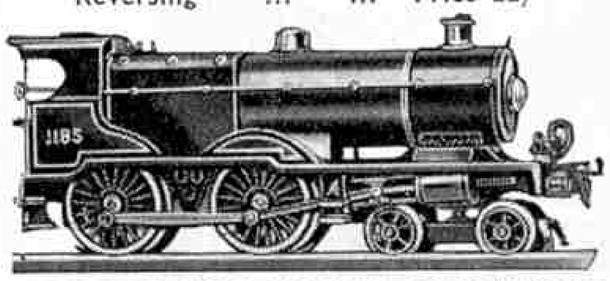
***HORNBY E120 (20-volt) or E16 (6-volt) LOCOMOTIVE**
Reversing ... ... Price 24/–



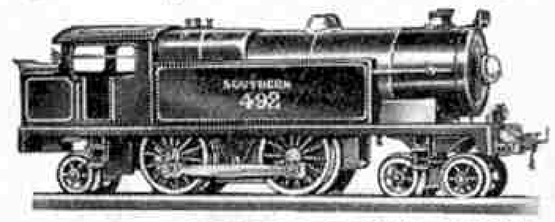
***HORNBY E120 (20-volt) or E16 (6-volt) TANK LOCOMOTIVE**
Reversing ... ... Price 24/–



***HORNBY E120 SPECIAL LOCOMOTIVE (20-volt)**
Automatic Reversing. Price 30/–

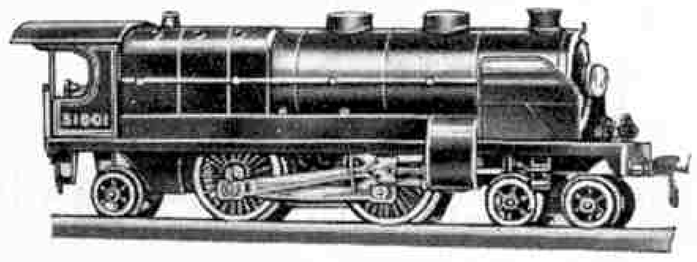


***HORNBY E220 SPECIAL LOCOMOTIVE (20-volt)**
Automatic reversing: L.M.S.R. "1185" ("Standard Compound" class), G.W.R. "County of Bedford" ("County" class), L.N.E.R. "Yorkshire" ("Shire" class), S.R. "A759" ("L1" class) ... ... Price 37/6



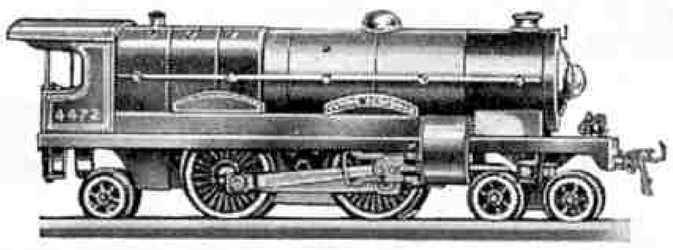
***HORNBY E220 SPECIAL TANK LOCOMOTIVE (20-volt)**
Automatic reversing ... Price 32/6

***HORNBY E26 SPECIAL TANK LOCOMOTIVE (6-volt)**
Reversing ... ... Price 30/–



HORNBY E320 RIVIERA "BLUE" LOCOMOTIVE (20-volt)
Automatic reversing ... ... Price 35/–

HORNBY E36 RIVIERA "BLUE" LOCOMOTIVE (6-volt)
Reversing ... ... Price 32/6



***HORNBY E320 LOCOMOTIVE (20-volt)**
Automatic reversing ... ... Price 35/–

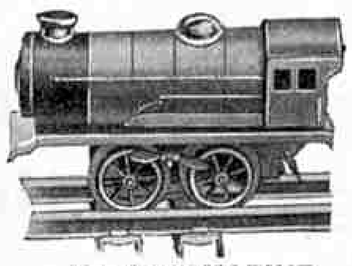
***HORNBY E36 LOCOMOTIVE (6-volt)**
Reversing ... ... Price 32/6



***HORNBY EPM16 SPECIAL TANK LOCOMOTIVE (6-volt Permanent Magnet Type)**
Reversing. Can be run from a 6-volt Accumulator or from the mains through the Meccano T ansformer-Rectifier. Complete with a 6-volt Terminal Connecting Plate, Speed and Reverse Control Switch and 3 feet of flex.
Price 33/6

Clockwork Models

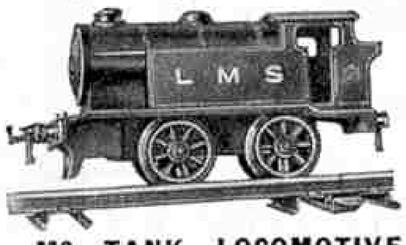
Hornby Clockwork Locomotives are the longest running spring-driven locomotives in the world. The motors fitted are of the highest quality, being perfect pieces of mechanism with accurately cut gears that ensure smooth and steady running.



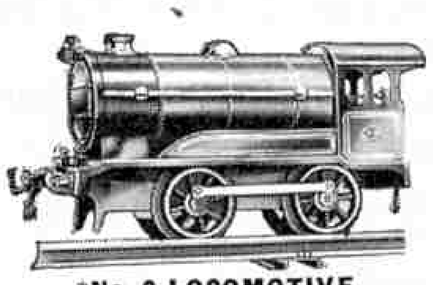
MO LOCOMOTIVE
Non-Reversing. Available in either red or green. Price 2/9



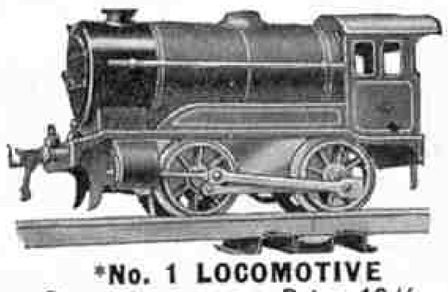
M1/2 LOCOMOTIVE
Reversing. Available in either red or green ... Price 4/6



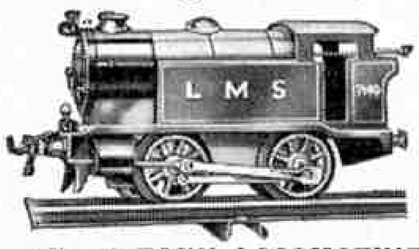
M3 TANK LOCOMOTIVE
Reversing. Available in red with L.M.S.R. lettering, or green with L.N.E.R., G.W.R. or S.R. lettering. Price 7/6



***No. 0 LOCOMOTIVE**
Reversing ... Price 10/6



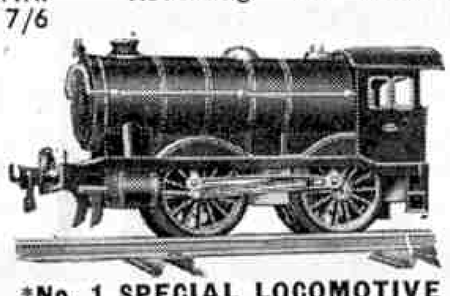
***No. 1 LOCOMOTIVE**
Reversing ... Price 12/6



***No. 1 TANK LOCOMOTIVE**
Reversing ... ... Price 12/6



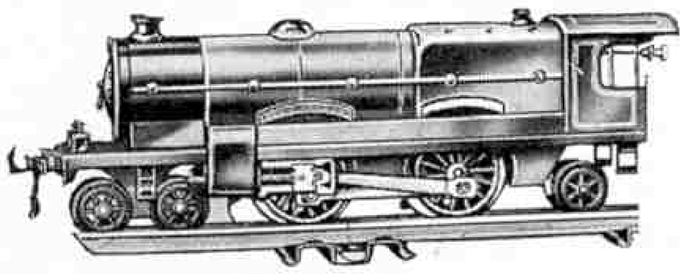
No. 3c RIVIERA "BLUE" LOCOMOTIVE
Reversing ... ... Price 24/–



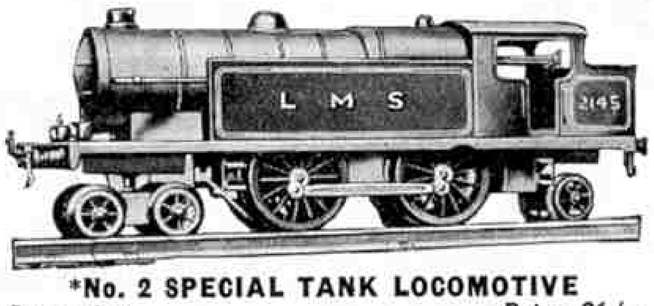
***No. 1 SPECIAL LOCOMOTIVE**
Reversing ... ... Price 17/6



***No. 1 SPECIAL TANK LOCOMOTIVE**
Reversing ... ... Price 17/6

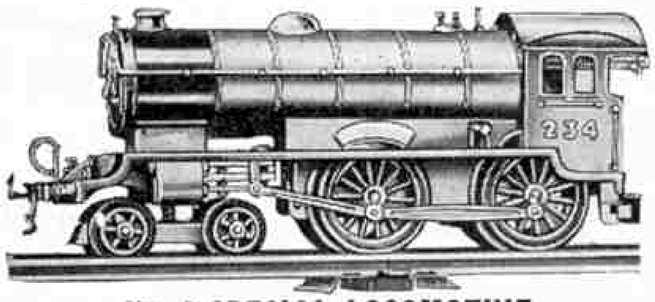


No. 3C LOCOMOTIVE
Reversing. "Caerphilly Castle" (G.W.R.), "Flying Scotsman" (L.N.E.R.), "Royal Scot" (L.M.S.R.), "Lord Nelson" (S.R.) ... ... Price 24/–



***No. 2 SPECIAL TANK LOCOMOTIVE**
Reversing ... ... Price 21/–

**Lettered and coloured to represent L.M.S.R., G.W.R., L.N.E.R. and S.R. Locomotives.*



No. 2 SPECIAL LOCOMOTIVE
Reversing. L.M.S.R. No. 1185 ("Standard Compound" class), G.W.R. "County of Bedford" ("County" class), L.N.E.R. "Yorkshire" ("Shire" class), S.R. No. A759 ("L1" class) ... Price 27/6

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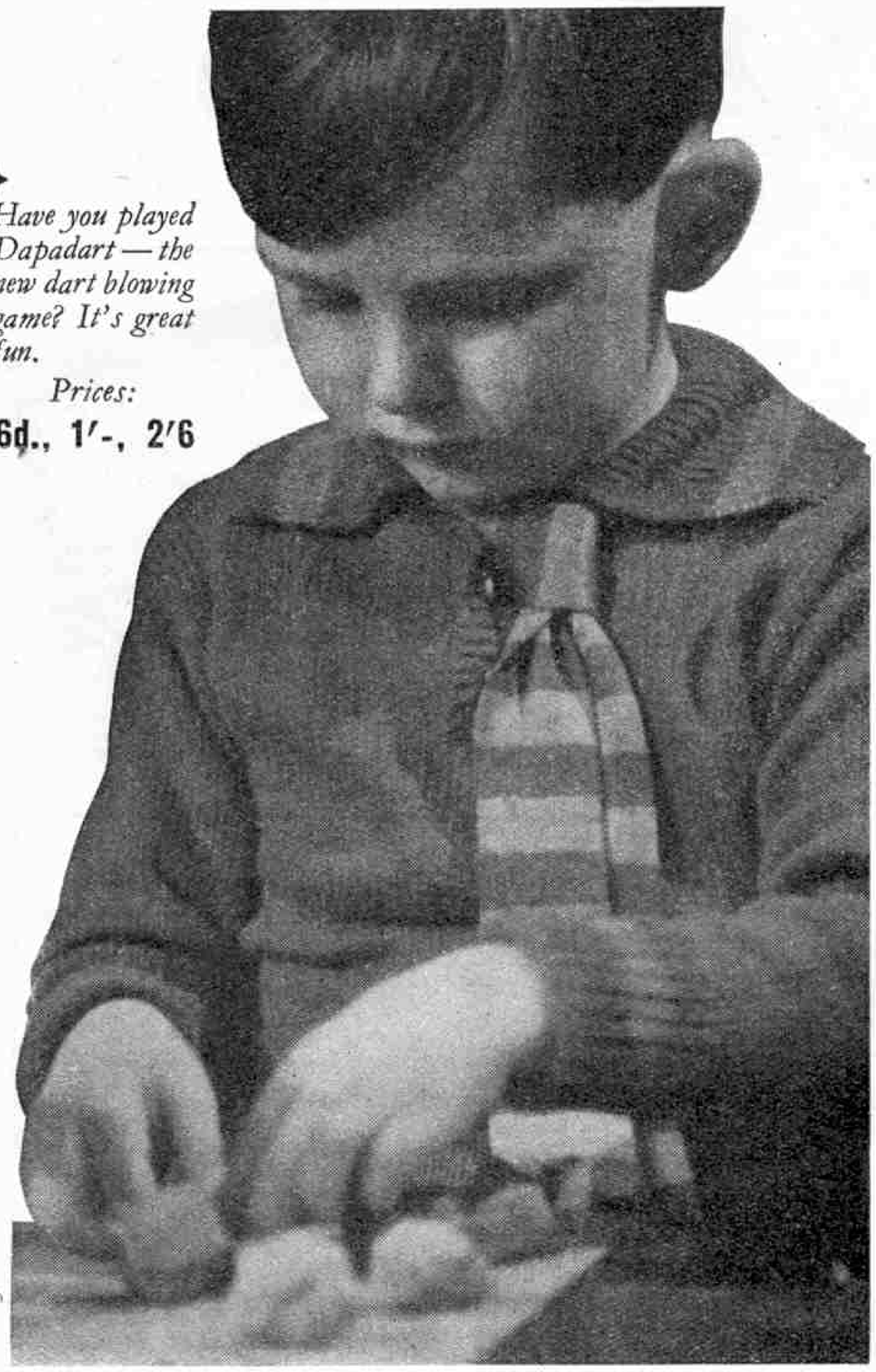
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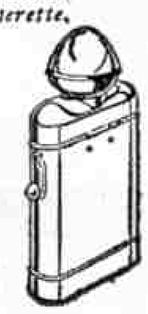
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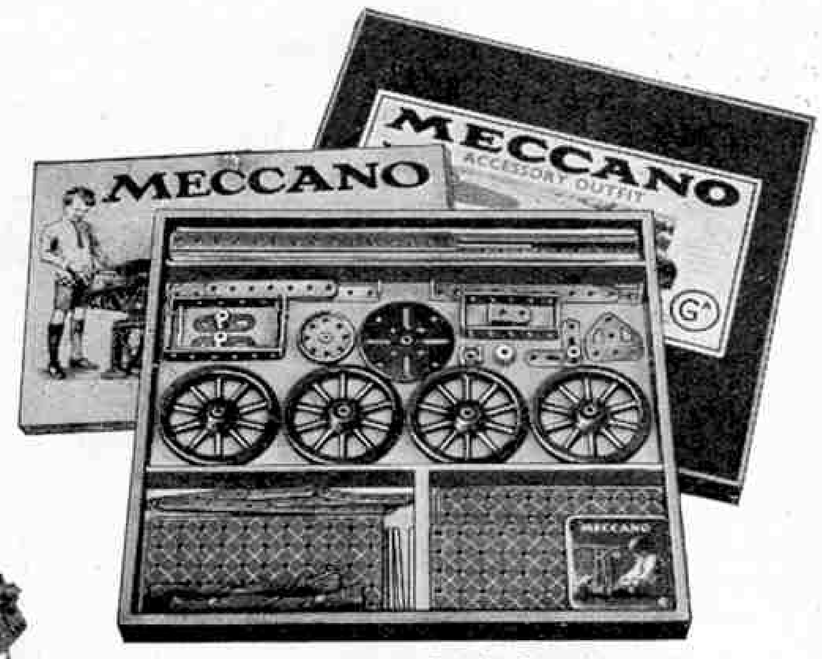
KEEP ADDING TO YOUR OUTFIT



Accessory Outfit Ba

The purpose of Meccano Accessory Outfits is to connect the main Outfits from A to L. They are best described as the stepping stones to bigger and better models. A B Outfit may be converted into a C by adding to it a Ba Accessory Outfit, and a Ca would then convert it into a D. Thus, no matter how small the Outfit you commence with, you may build it up by degrees until you possess all the parts contained in the largest Outfit.

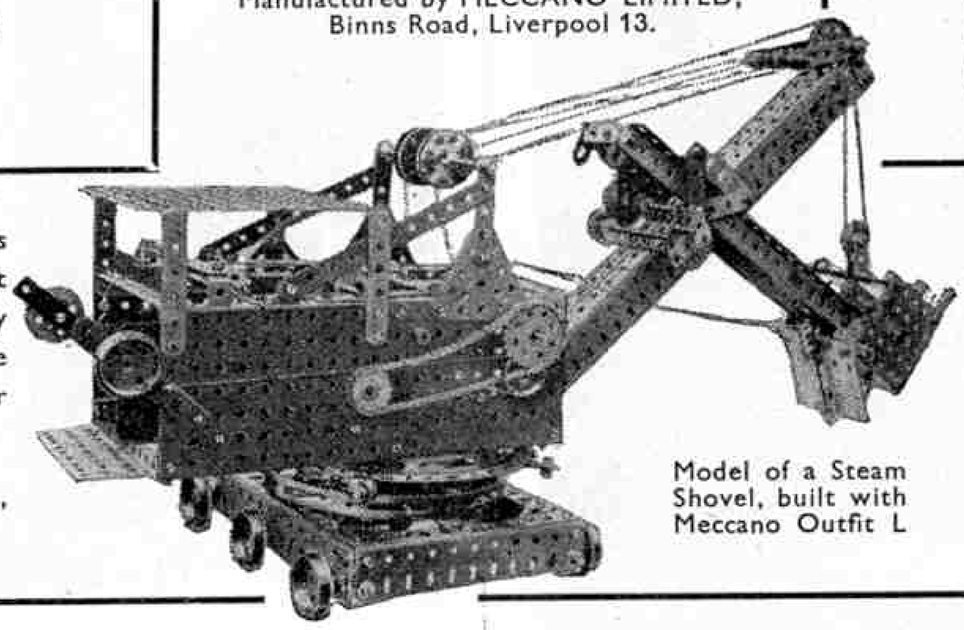
Manufactured by MECCANO LIMITED, Binns Road, Liverpool 13.



Accessory Outfit Ga

Think of the hundreds of additional models you could build if you converted your present Meccano Outfit into the one next higher by means of a Meccano Accessory Outfit. The enjoyment you already obtain from your hobby would increase tremendously.

Get the Accessory Outfit you want to-day, and have more fun!



Model of a Steam Shovel, built with Meccano Outfit L

PRICE LIST
MECCANO ACCESSORY OUTFITS

Aa	converts	A	Outfit into	B	...	Price	2/6
Ba	,,	B	,, ,,	C	...	,,	3/–
Ca	,,	C	,, ,,	D	...	,,	5/6
Da	,,	D	,, ,,	E	...	,,	5/6
Ea	,,	E	,, ,,	F	...	,,	11/–
Fa	,,	F	,, ,,	G	...	,,	26/6
Ga	,,	G	,, ,,	H	...	,,	17/6
Ha	,,	H	,, ,,	K	...	,,	60/–
*Ka	,,	K	,, ,,	L	...	,,	225/–

*Enamelled Cabinet.

PRODUCT of MECCANO LIMITED LIVERPOOL

The Meccano Steam Engine



Specially designed to build into Meccano Models

You have already experienced the thrill of building real engineering models with Meccano . . . imagine the crowning joy of operating your models with the Meccano Steam Engine.

This fine engine is a magnificent power unit, fitted with reversing gear. The base and side plates are pierced with the standard Meccano equidistant holes, thus enabling it to be built into any Meccano model in the exact position required.

Steam is admitted to a single cylinder of the oscillating type through a special reversing block. Operation of the reversing lever enables the crankshaft to run in either direction.

The boiler is of heavy gauge brass and is fitted with an efficient safety valve.

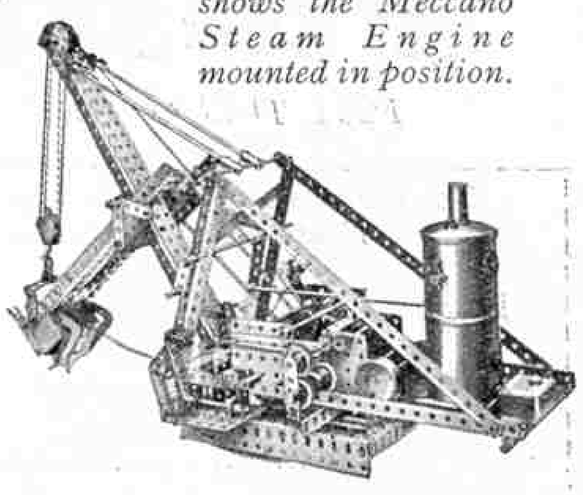
Price 25′-

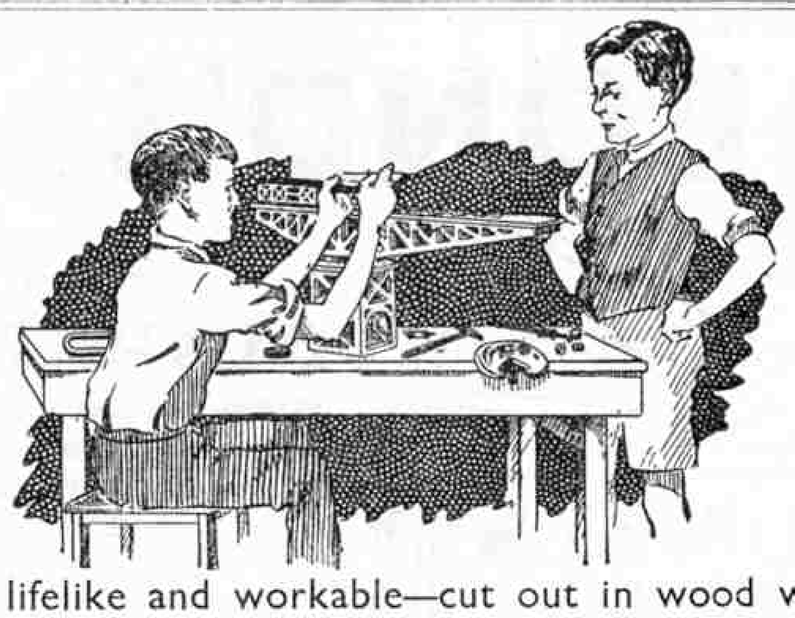
Height 7 ins.
Length 7 ins.
Width 4¼ ins.

The spirit container for the lamp is placed well outside the boiler casing, thus eliminating all risk of the spirit becoming heated.

MECCANO LTD.
BINNS ROAD, LIVERPOOL 13

This fine model of a Steam Excavator shows the Meccano Steam Engine mounted in position.

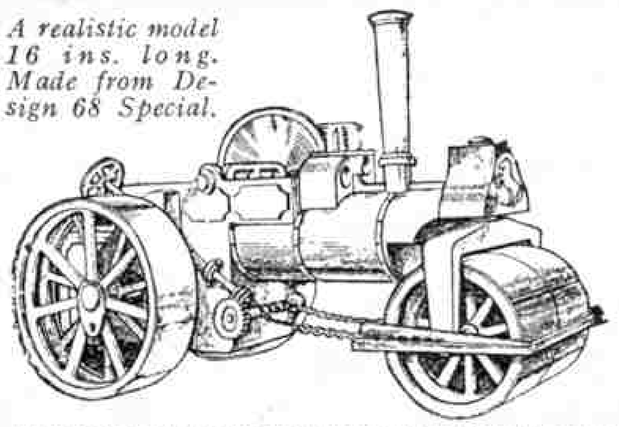




Models you can make in wood

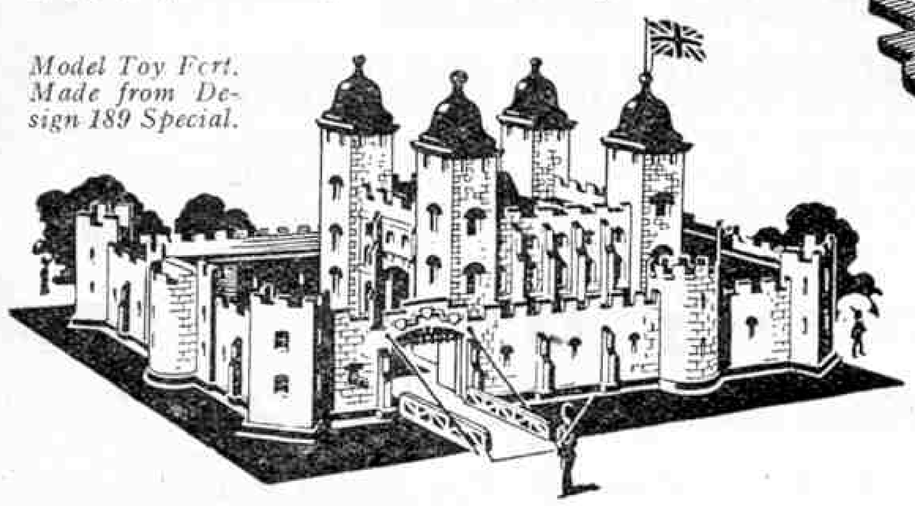
JOLLY good fun too. Cutting them out from the patterns provided is quite easy, and fitting the parts together is as good as any builder's job. Ships, locomotives, buildings, cranes—lifelike and workable—cut out in wood with a fretsaw. A great game for spare time—to say nothing of prizes to be won with the models at the school exhibitions. A set of necessary tools — a Hobbies Fretwork Outfit — costs as little as 1/6, and free patterns are given with Hobbies Weekly.

A realistic model 16 ins. long. Made from Design 68 Special.



LISTS FREE A new illustrated list of models you can make, with full particulars, sent free on request to the address given below.

Model Toy Fort. Made from Design 189 Special.





St. Paul's Cathedral, 16 ins. long. Made from Design 187 Special.

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You should read Hobbies Weekly for helpful spare time hobbies. Price 2d. every Wednesday. A free specimen copy sent to any reader of the Meccano Magazine who writes to Dept. 96, Hobbies Ltd., Dereham, Norfolk.

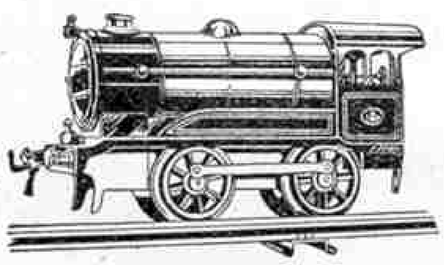
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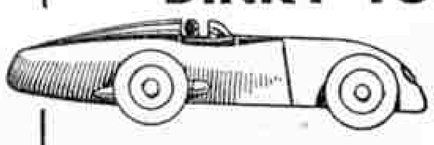
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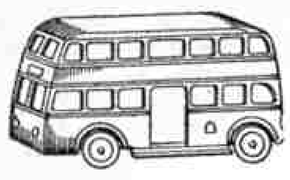
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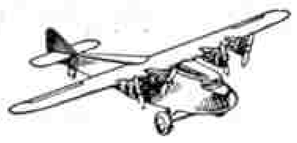
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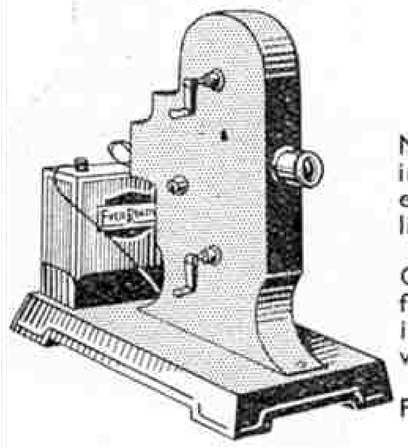
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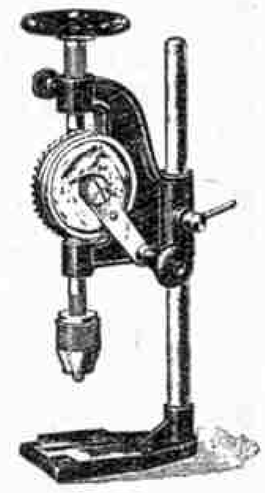
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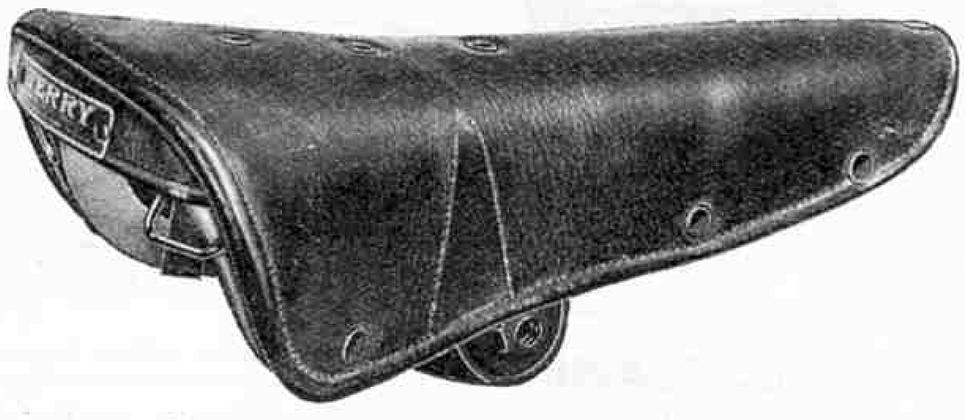
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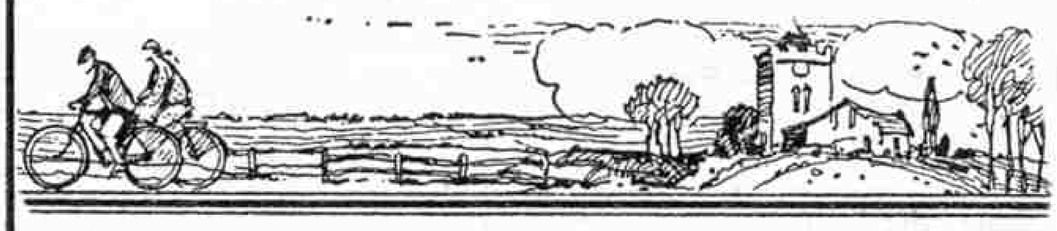


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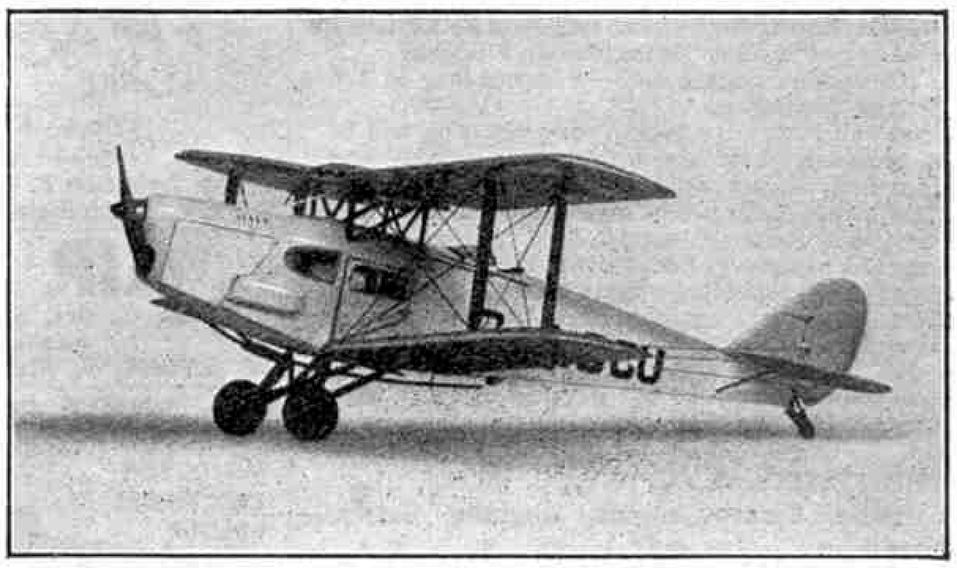
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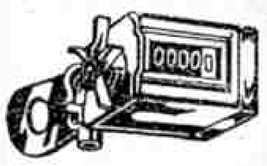
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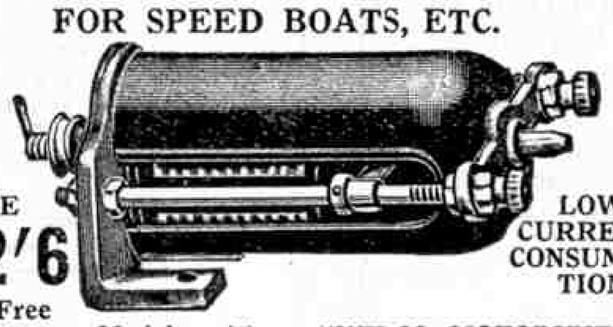
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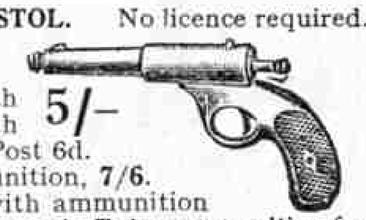
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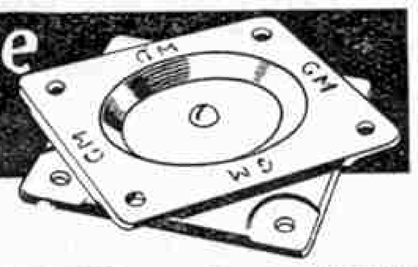
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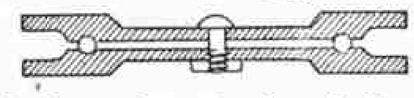
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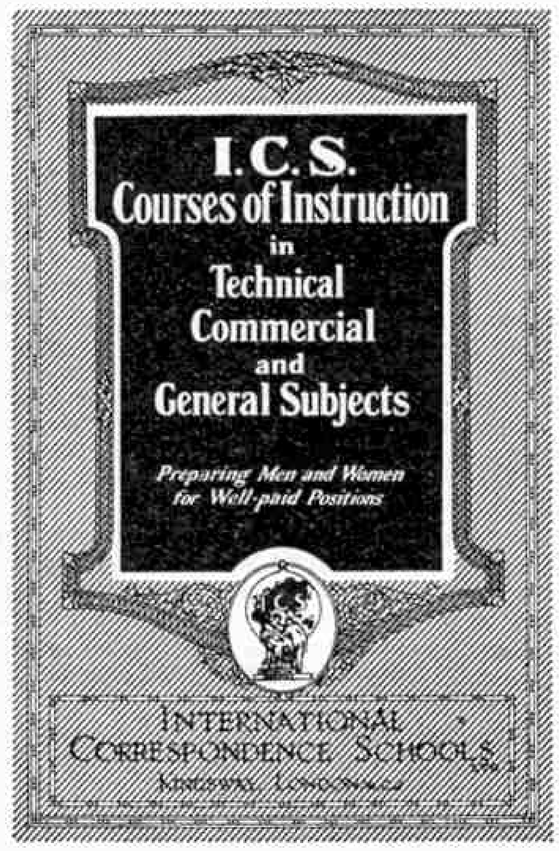
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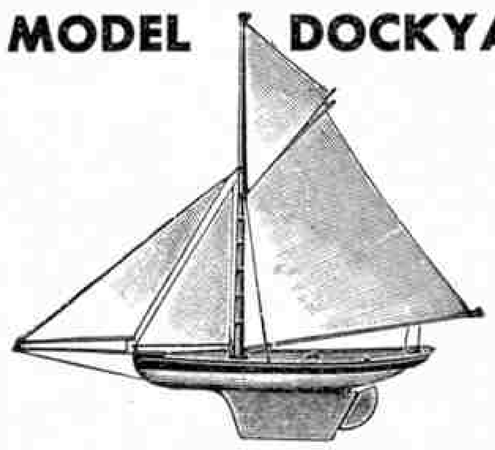
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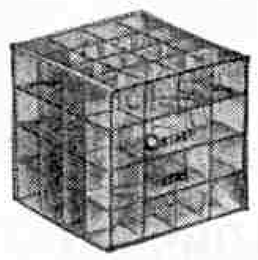


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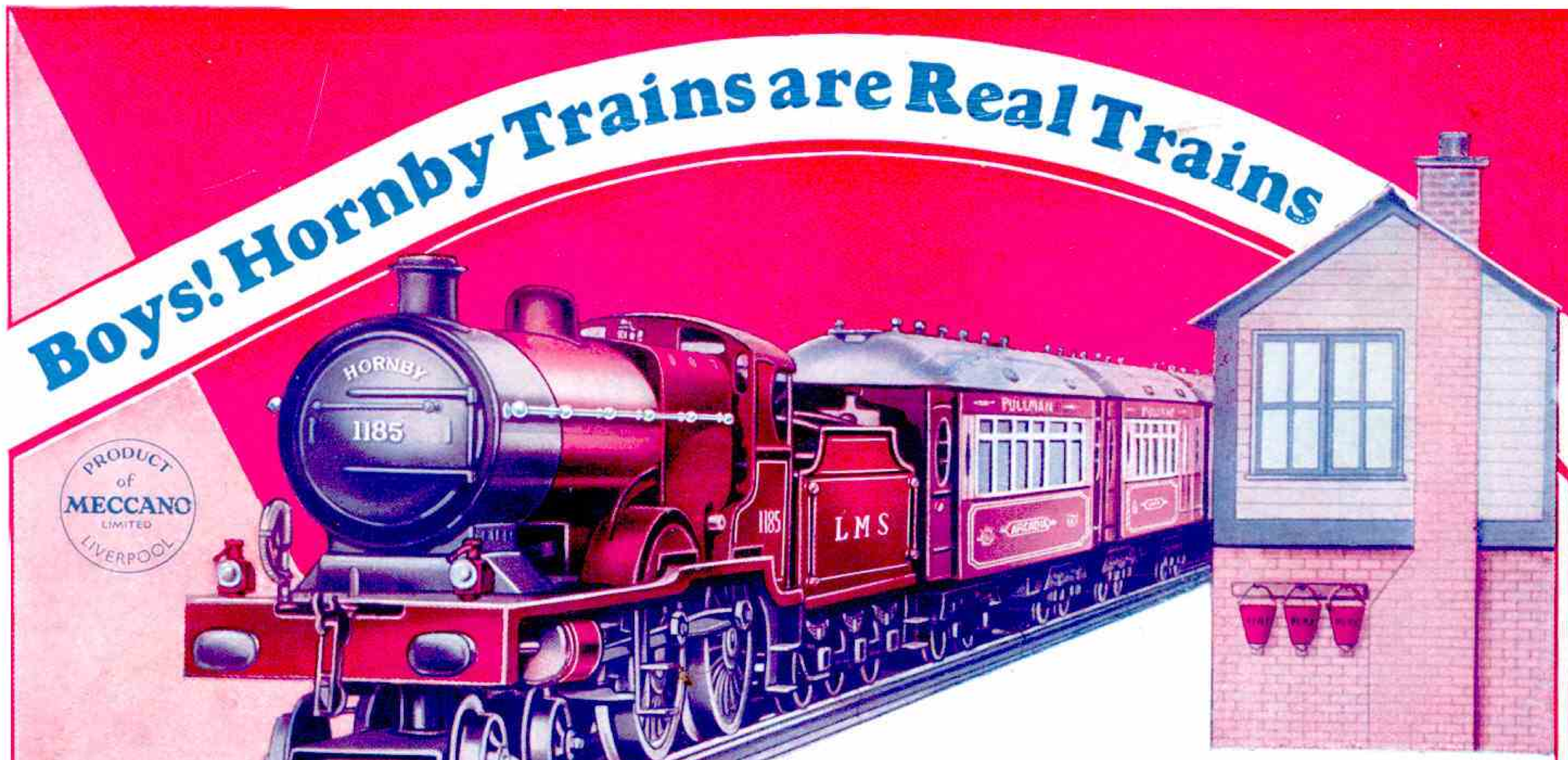
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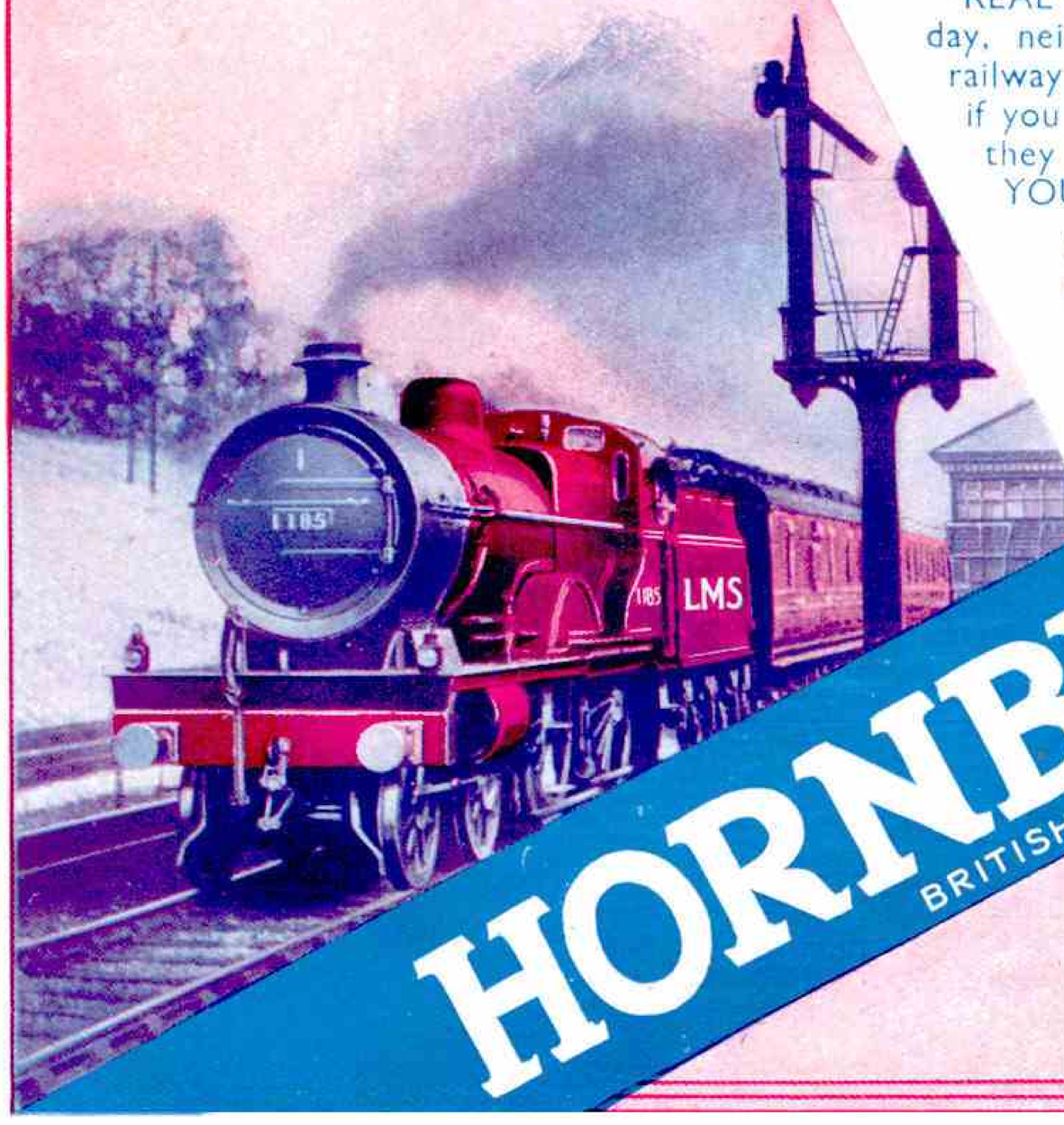
REAL railways do not consist of only a locomotive and a couple of carriages. There are stations, signals, goods wagons, points, level-crossings, loading gauges, breakdown vans, snow ploughs. All these and many other items of rolling stock and accessories are included in the Hornby System.

REAL trains do not run round and round a circular track all day, neither do Hornby Trains. You can build up a REAL railway system in miniature—complete to the smallest detail—if you like. That is why Hornby Trains are such good fun—they are so real that you are not just playing at trains—YOU OWN AND RUN A REAL RAILWAY.

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